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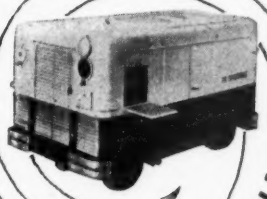

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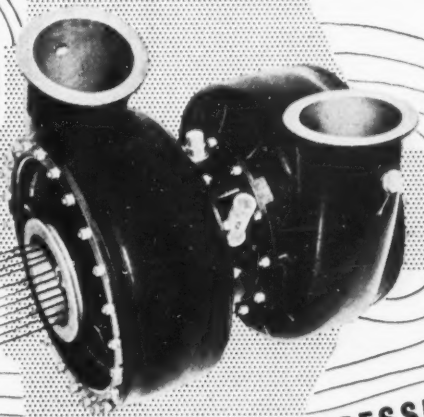

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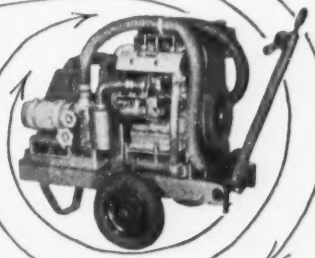

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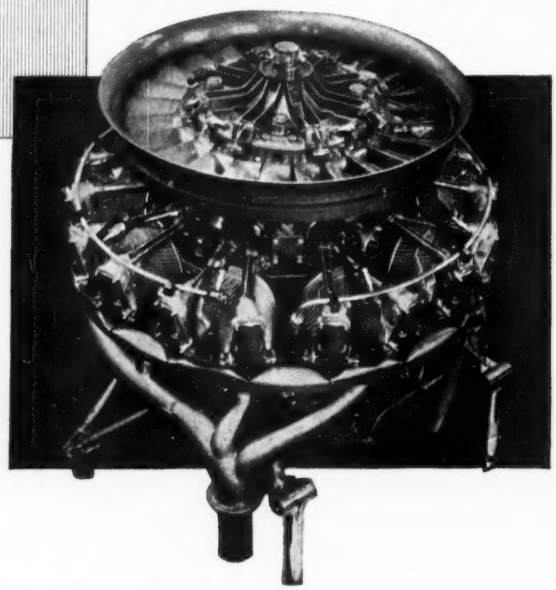

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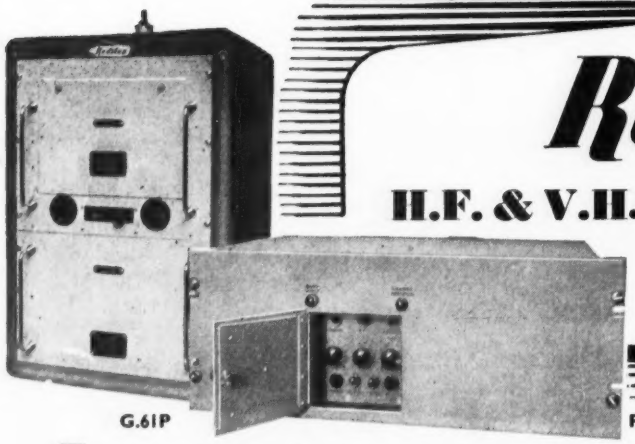

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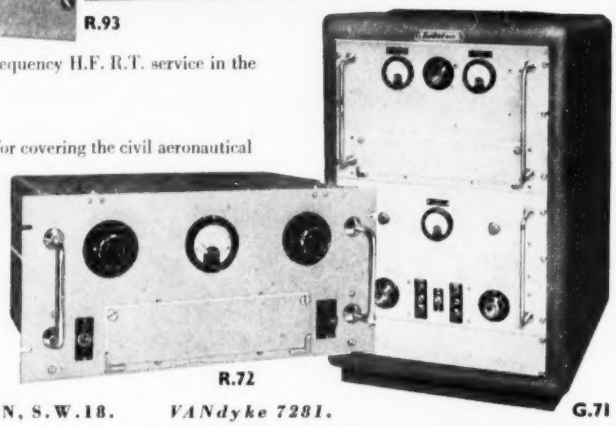

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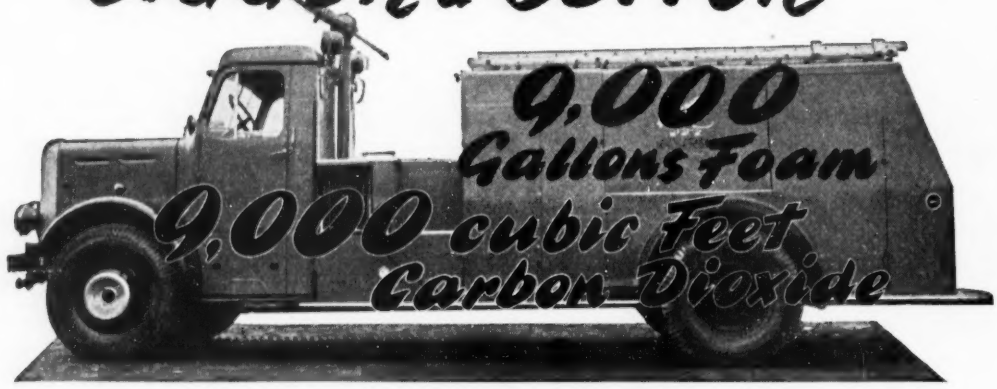

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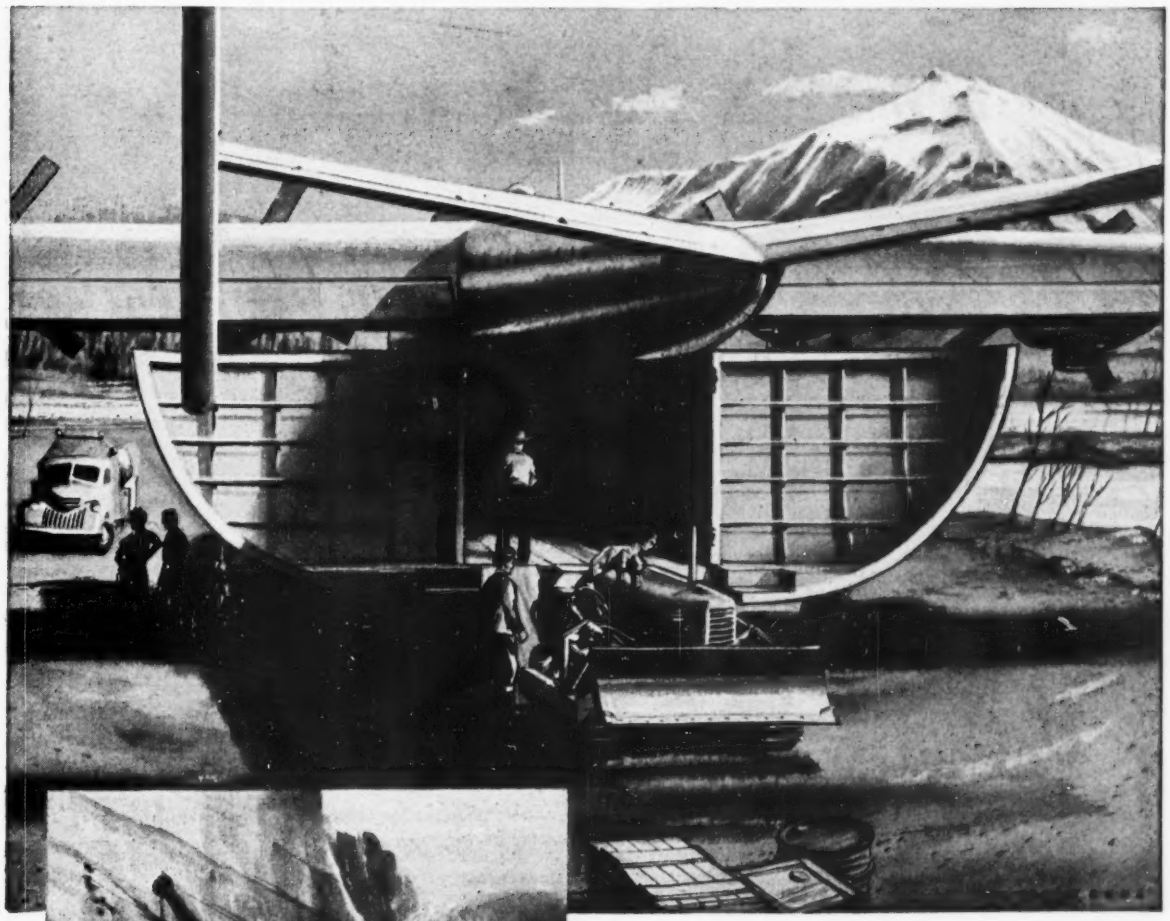

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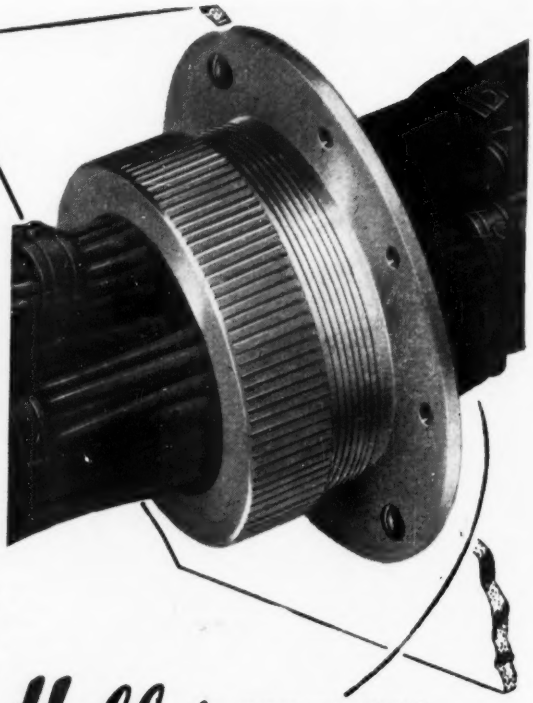

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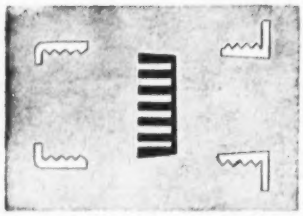

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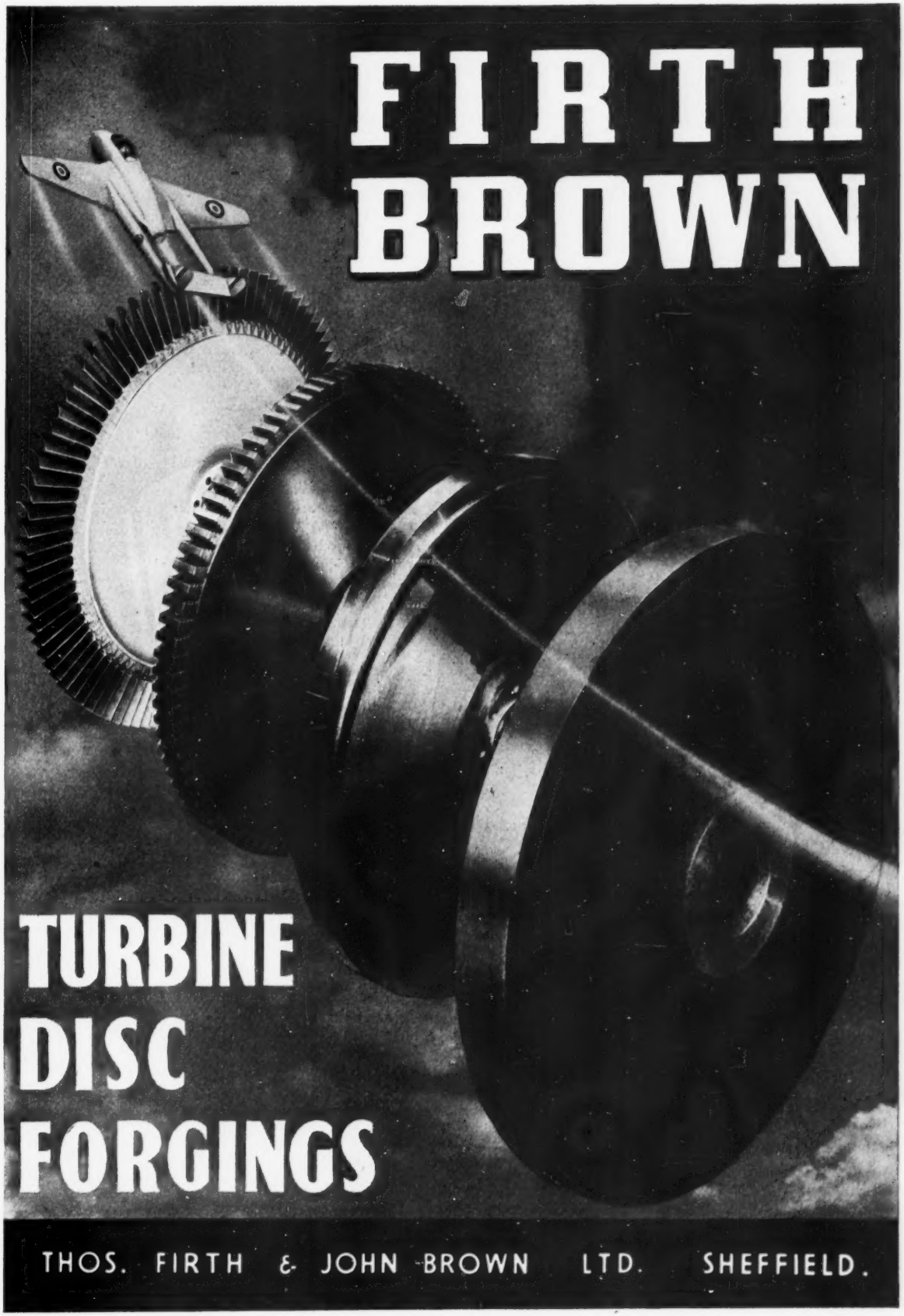
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IN THIS ISSUE:

Guide to National Air Races - - - - - - 742
The Honours List - - - 745
Coronation Day - - - 746
Royal Naval Review and Fly-past - - - - - 750
Aeronautical Acoustics - 755

Sound Thinking

THERE is at present no denial of the fact that jet-engine noise constitutes an urgent problem. The recent joint symposium under Royal Aeronautical Society and Physical Society auspices (see pages 755-758) brought together many technical men concerned with both practical and theoretical aspects of aviation noise and its abatement, and gave a useful airing to the applied problems. One point made is worthy of especial note. Professor Richards of Southampton University, replying to the discussion on the first part of the proceedings, emphasized that a basic reduction in jet velocity, rather than an attempted modification of the characteristics of high-velocity engines, should be the aim, since the price in noise paid for such velocities was well known. In high-speed aircraft research there was a parallel; designers made a wing that fluttered, and then incorporated an anti-flutter device, which was not the best approach. Further, stated Professor Richards, it was time that engine manufacturers tackled the problem of what should be the differing characteristics of military and civil engines.

It is pertinent here to mention a simple concept—though one that seems often to have been forgotten; it is that, basically, undue noise is an unpleasant thing, and in general the quieter things are the better. With increasing industrial and technical development over the years have inevitably come noisier mechanical methods, including methods of propulsion—under the overall term "progress." And yet military and civilian requirements have remained different: war is necessarily a noisy business—peace should not be so. And this applies to the engines powering today's military and civil machines. Fuel economy is one obvious requirement for the civil airliner, and this can well go hand in hand with the quest for quietness in engines.

A change of attitude would help. Instead of taking a noisy engine and attempting to silence it, maintained Professor Richards, the *initial design* should be for a quiet engine. With this we agree. The technical difficulties we well appreciate—they were sensibly brought out in the contributions to the symposium—but with the attitude heard in the industry that the British public is unduly sensitive to noise we do not agree. In desiring peace and quiet, they are in the right. And any steps, including those that are at present being taken, to reduce the noise-nuisance caused by aircraft are well worth while.

The Higher the Fewer

IT occurred to us while musing on W/C. Gibb's new 63,668ft height record in the Olympus-Canberra that, although Great Britain has far fewer such records to her credit than either France or America she, more than any other nation, has exploited her high-altitude research in civil and military fields. The Comet, of course, remains the pre-eminent—indeed, the sole—example of the ultra-high-altitude civil transport. It is a very fast aircraft because it cruises, fully loaded, at a very high level—a level which probably exceeds that attainable even by the American jet bombers and which approximates to that of our own Canberra. Later marks may fly yet higher. As for our V-bombers—the Valiant, Vulcan and Victor—the wing loading of each is evidently of a moderate order, and in the case of the Vulcan might even be described as low. Certainly the operating altitude of all three types should prove to be well above that of the B-47 and, it may be supposed, of the later B-52, B-60 and RB-66 also.

For the attainment of ultimate performance at height, of course, a moderate wing-loading must be reconciled with maintenance of thrust at the desired level; and the difficulties implicit in this are many and great. The achievement of the "supercharged" Bristol Olympus two-spool turbojet in thrusting a standard Canberra airframe to the new record height is therefore most significant. Especially, it portends transcendent performances for the Vulcan bomber and Atlantic transport, introduced in this issue.

True, we are not alone in our development of the two-spool turbojet, for the Pratt and Whitney J57, of similar form, has been flying for many months in the Convair B-60 and Boeing B-52. But it does appear that by keeping wing-loadings on the light side the designers of our new transports and bombers (and, for that matter, fighters also) will be enabled to apply the high outputs at altitude, of which the Olympus has proved itself capable, to singularly good advantage.

FROM ALL QUARTERS

B-47 Wing Arrives

FIRST unit to be equipped with the Boeing B-47B Stratojet medium bomber, the 306th Medium Bombardment Wing is normally based at MacDill A.F.B., Florida. During the past eighteen months the unit has been gradually working up to a fully operational standard, and now is in a "go-anywhere, do-anything" condition.

Accordingly, and in conformity with U.S.A.F. practice, the Wing is on detachment to this country for 90 days' continuous training. The aircraft have flown from MacDill by way of Limestone, Maine, where their crews were given a few hours' rest. The total distance from Florida is in the region of 4,500 miles, and the first aircraft made the 3,125-mile transatlantic crossing in 5 hr 53 min (rather over 530 m.p.h.).

The U.S.A.F. are anxious that it should be known that the bombers are fully operational, and were cruised at normal long-distance thrust; had they been after records, apparently, the figure could have been over 600 m.p.h. Flight refuelling was not used. The B-47s carried their normal crews of three "triple-head" personnel, each of whom can act as pilot, navigator or bombardier. A dummy bomb-load was also carried, and mock attacks were made at selected points during the Atlantic crossing.

The 306th Wing is commanded by Col. Michael McCoy, who —like many U.S.A.F. top-ranking bomber pilots—is in his late forties. He piloted the first B-47 across, leaving Limestone on Thursday, June 4th, and arriving at the great base at Fairford, Glos, early in the evening. Fourteen other B-47s arrived on that day, and fifteen more on each of the following two days, thus bringing the Wing up to its full strength of 45 aircraft. The last machine made the journey in 5 hr 26 min, giving an average speed of 575 m.p.h. The crossings were the first direct flights from the U.S.A. to Great Britain by jet aircraft.

The aircraft themselves, which are sure to excite considerable interest in this country, are recent-production B-47Bs, with flat-fronted engine-pods. Underwing tanks have not been brought with them, but tail-braking parachutes are fitted and were, in fact, used on their first landings in this country.

Records for Dunkerley

SUBJECT to confirmation by the F.A.I., Fred Dunkerley, the well-known racing pilot, last Friday set up six new light aeroplane records during flights between London and Brussels, and London and the Hague, in his Miles Gemini, G-AKKB (two Cirrus Minor 2s). In the morning he flew from Bovingdon (Herts) to Grimbergen, outside Brussels, and back again, in 2 hr 30 min 45 sec; he touched down, for a few seconds only, at the halfway point. In the afternoon he similarly flew to Ypenburg and back in 2 hr 34 min 39 sec. Both trips were made unaccompanied. Speeds in km/hr (m.p.h. in parentheses) were as follows: London-Brussels, 245 (152.3); Brussels-London, 271.9 (169); London-Brussels-London 256.7 (159.5); London - The Hague, 253.2 (157.3); The Hague-London, 274.7 (170.7); London - The Hague-London, 262.9 (163.3).

Ramsgate Re-opening

ESSENTIALLY a peace-time airfield—in that it was opened in 1936 but was used for agriculture throughout the war —Ramsgate Airport is to be officially re-opened on June 27th by Mr. Lennox-Boyd, Minister of Civil Aviation. Ramsgate has actually been in use since June 1st last year, when Air Kruise, Ltd., opened a scheduled service to Le Touquet *via* Lympne (for Customs clearance), having obtained a 21-year lease from Ramsgate Corporation. Since then, however, the hangar and airport building have been renovated, facilities improved and the Ramsgate Flying Club has been re-formed. Among the club's most active supporters are U.S.A.F. personnel from Manston, who will take part in a flying display held to mark the re-opening ceremony. Aircraft of the R.A.F. and R.Aux.A.F. and the French Air Force will appear during the afternoon.

Busy Week-end

THE summer season of aeronautical week-end events, which has been increasing in intensity during the past month despite a number of meteorological set-backs, reaches a high level of activity tomorrow (Saturday, the 13th) and the next days with a variety of meetings in England and abroad.

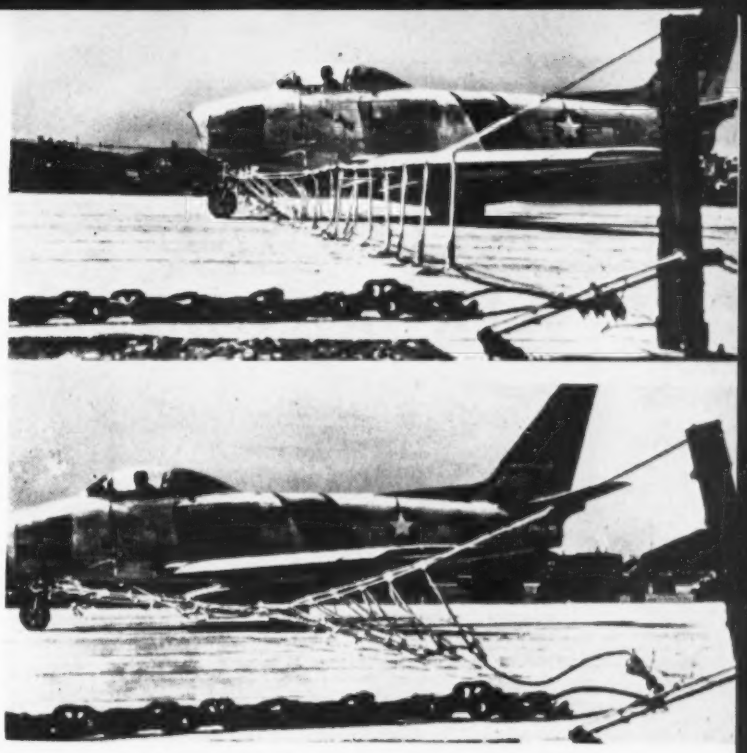
In this country, on Saturday, there is the Naval At Home at Lee-on-Solent, with an air display followed by 200 aircraft taking-off to participate in a practice for the Coronation Review fly-past. Gates will be open at 1200 hr, the display will run from 1430 to 1545, and aircraft will be taking off for and landing from the fly-past between 1600 and 1900 hr: no car-park movement will be allowed during this latter period. Admission will be free, but car-parking and programme sales proceeds will go to Naval charities; pleasure flight profits will also contribute to this cause.

On Sunday, the 14th, the Royal Aeronautical Society's annual garden party is being held at de Havillands' airfield at Hatfield. Emphasis this year is on 50 years of powered flight, and a large variety of interesting aircraft—already listed in our pages—will be on view. If the weather is kind, some of the older machines will fly. Only members and their guests are eligible to attend

On the 15th, the Royal Naval Coronation Review will take place in Spithead: full details of the fly-past plans appear on pages 750-754 of this issue.

Abroad, the most noteworthy event is the Rhodes Centenary.

WHOA!: The first Boeing B-47B to be based in this country streams its tail parachute as it touches down at Fairford. The other picture is of its crew after being met at Fairford by the Commanding General, 7th Air Division, Brig-Gen. J. C. Selser; (left to right) Gen. Selser, Majors Charles Johnston and Bill Looney, and Col. Mike McCoy.



THOROUGHLY SOUND BARRIER: The net depicted in the act of arresting a U.S.A.F. Sabre has been developed to allow damaged jet fighters to use small emergency landing-strips. In the top view a Sabre's nose oleo has penetrated a "tennis net" barrier, thereby triggering an arresting cable which springs up to catch the main undercarriage legs (bottom view). The gear has been developed by the Far East Air Force's 6,400th Maintenance Group at a cost of $14,000, and has already saved ten Sabres, valued at $240,000 each—"and possibly," sagely adds a news agency caption, "the lives of ten pilots on which there is no price."

Air Display being held at Salisbury Airport on the 13th and 14th. Military aircraft due to appear include 12 Venoms of 266 Squadron, a Canberra, a Meteor NF 11, two Hastings, two Valettas and a Lincoln of the R.A.F.; three Vampires of the S.A.A.F.; and aircraft from the Rhodesian Air Training Group. Over 600 flying club members and private owners have been invited to attend, and races and other competitions will be held between the visiting aircraft. Acceptances have already been received from Kenya and the Union of South Africa. Other items include a glider aerobatic display and a crop-dusting demonstration.

In conclusion, the Aero-Club d'Italia is holding its air tour of Sicily on the 13th and 14th, and the Aero-Club de Tangier is holding its annual rally on the latter day.

Air Marshal Curtis for Avro Canada

IT has been announced that Air Marshal W. A. Curtis, C.B., C.B.E., D.S.C. and bar, E.D., LL.D., has been elected vice-chairman of Avro Canada, Ltd. Speaking of the appointment, Sir Roy Dobson (chairman) said that it was most appropriate that the new director, after an outstanding military career, should be resuming business with Avro Canada because, if anyone could be said to have "fathered" the CF-100, which the company was now producing, it was the air marshal.

Air Marshal Curtis.

Born in 1893, Air Marshal Curtis joined the Canadian Army in 1915, learned to fly at his own expense, and in 1916 transferred to the R.N.A.S., in which he had a distinguished career as a fighter pilot, winning the D.S.C. and Bar. He was invalided home in 1918, and thereafter served for eight years in the Army whilst retaining a place in the Canadian Air Force Reserve. Thus by this time he had already worn the uniforms of all three Services.

Subsequently he became a founder of the Toronto Flying Club, and helped to organize No. 110 Auxiliary Squadron, R.C.A.F., later becoming its C.O. In 1938 he was promoted to wing commander in charge of the auxiliary squadrons at Toronto, Hamilton and London, and in 1939 was assigned to Regular duty. From November, 1941, to January, 1944, he served abroad as the Deputy C-in-C. of the R.C.A.F. overseas, and later was Air Member for Air Staff and for Air Plans at R.C.A.F. Headquarters in Ottawa, before succeeding Air Marshal Robert Leckie as C.A.S. in 1947. He retired on January 31st, 1953, having seen the R.C.A.F. through a critical period of planning and expansion during the cold war.

More About The Jindivik

THE Australian-designed Jindivik pilotless target aircraft, details of which were given in *Flight* on May 8th, 1953, and April 25th, 1952, is now known to carry remote-control equipment developed mainly in the United Kingdom by the Royal Aircraft Establishment, in conjunction with the General Electric Company; G.E.C. have also manufactured the equipment. The autopilot is an R.A.E. design, manufactured by Elliott Brothers (London), Ltd.; telemetering equipment is likewise R.A.E.-developed and is manufactured by McMichael Radio, Ltd.

Take-off is effected from a tricycle trolley, the nosewheel of which is steered by a gyro-controlled system. The aircraft is mounted on three trolley arms in such a way that it has a limited degree of freedom in pitch about the two rear arms, which locate on fittings under each wing. The front arm, positioned in a fitting (under the fuselage) which permits about 3in relative vertical travel between stops, is restrained by a tension rod between a release hook on the arm and the main trolley structure. When the pre-set take-off speed is attained an electrical circuit is closed by a contacting A.S.I. in the aircraft. Up-elevator is automatically applied to adjust the aircraft to the unstick attitude demanded by the autopilot; and when the relative nose-up rotation between aircraft and trolley is nearing its limit a further circuit is made between contacts on the front trolley arm and the fuselage fitting. The hook in the front arm is released and all three arms are then free to fall away, with bungee assistance. Simultaneously, brakes are applied on the rear wheels of the trolley. Should it be desired to arrest the take-off run, the brakes are applied by an actuator as soon as the "fuel off" signal is sent to the aircraft.

A small amount of flap is applied for take-off by manually depressing the flaps until they lock in the required position against a spring-loaded strut. As soon as the hinge moment reaches a preset value, the lock is withdrawn and the flaps return to neutral.

Release from the trolley takes place quite rapidly, and photographs from a high-speed ciné record show that 0.8 sec after the contacting A.S.I. has operated the Jindivik is several feet above the trolley, which is already falling astern.

The landing is made on a single central skid, which has an oleo-pneumatic shock-absorber capable of absorbing energy from a rate of descent of 14ft/sec. Prior to the aircraft being mounted on the trolley, air is exhausted from the strut and the skid is locked up. When the "undercarriage down" signal is received, air is passed from a ground-filled high-pressure bottle through a reducing valve to the up-lock and thence to the strut. This forces the skid down and leaves the strut set to act in its shock-absorbing rôle. At the same time, through a tension rod between the strut and a lever on the flap torque tube, the flaps are depressed fully. On touch-down the skid is depressed and the flap angle is reduced accordingly, thus reducing the tendency of the aircraft to bounce. Photographs show that, notwithstanding the full 14ft/sec rate of descent, the Jindivik remains firmly on the ground.

Control for landing is handled by two men. One is located at the end of the overshoot area to control direction, and the other, who controls elevation, is adjacent to the desired touch-down point, about 300ft from the strip. For take-off the Jindivik is in the hands of this second operator, though, since the sequence is virtually automatic, he has only minor corrections to make.

Tournament Cavalcade

DIFFERING greatly from any R.A.F. representation in the past, the main item contributed by the Service to this year's Royal Tournament (in progress at Earls Court, London, until June 27th) is a "pageant of progress since 1911." Presented by Maintenance Command, it demonstrates advances in aircraft servicing methods since the days of the Air Battalion of the Royal Engineers. Personnel wearing the R.E. uniform are seen with a Bleriot monoplane and a Talbot touring car of the same period.

The next phase, 1914-18, is represented by men in R.F.C. and R.N.A.S. uniforms working on a Sopwith Camel, with a Crossley tender and car, and a P. and M. motor-cycle combination in attendance; the inter-war years are illustrated by a Bristol Fighter, Leyland lorry, Trojan van and Hucks starter; for World War II there is a Hurricane 2C drawn by a Fordson tractor, a typical "scramble" scene being staged; and the final episode, for today and the future, shows the servicing of a delta-wing F.D.1 (in replica) by a Bedford 950-gallon pressure refueller, David Brown tractors and a Thornycroft Mk 5 fire tender. This display also demonstrates arming with air-to-air guided weapons.

NATIONAL AIR RACES

A Guide for Spectators Visiting Southend Airport on June 20th

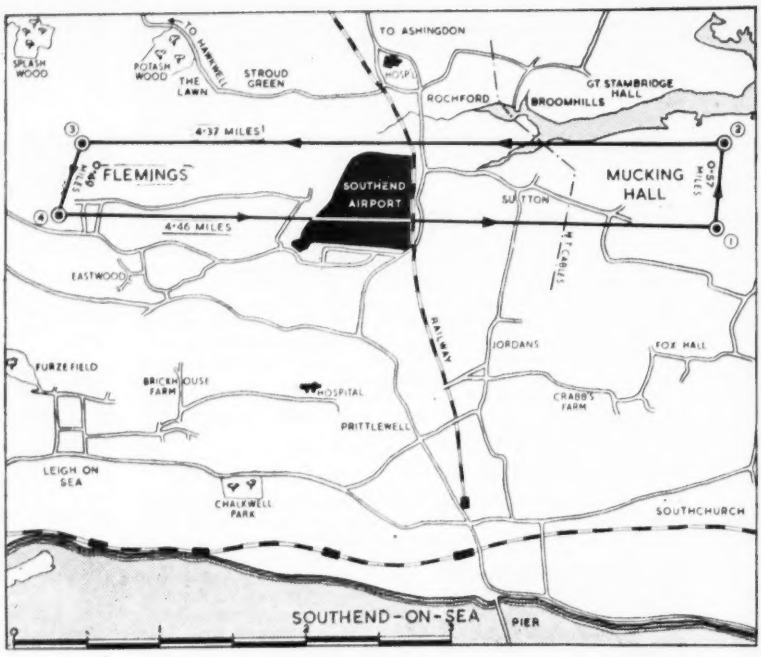
AS already announced, the 1953 National Air Races—organized by Southend-on-Sea Corporation in conjunction with the Royal Aero Club—are to be held at Southend Municipal Airport on Saturday, June 20th. Gates will be open at 10.30 a.m., and flying is to start at 2.30 and continue until 6 p.m. The races for the Grosvenor, Norton-Griffiths, and Kemsley Challenge Trophies will be flown first, and will be followed by an air display. In this, the items will be: Individual aerobatics by Meteor 7; demonstration by four R.A.F. (101 Sqn.) Canberras; individual aerobatics by a Sabre of the R.C.A.F. Fighter Wing; team aerobatics by four Sabres of No. 441 Sqn., R.C.A.F.; winch demonstration by a Dragonfly helicopter of No. 705 Sqn., Royal Navy.

Next will come the King's Cup Air Race, for which there will be twelve entrants—the first four finishers (of British nationality) from each of the three preceding events. Finally, the proceedings will be concluded by an aerobatic display by the Patrouille d'Etampes, followed by the prize-giving.

It cannot, unfortunately, be said that the entry lists, given below, display anything particularly novel or striking in the matter of aircraft; most of them, including some veritable veterans, have been competing, in the hands of the same pilots, in air races during the past few seasons. It is, however, worth noting that Nat Somers has entered his "new" Mew Gull, which he first raced at Wolverhampton on May 16th; perished oleo-leg oil seals kept him out of the Swansea Race a fortnight ago, but he hopes to have replacements in time for Southend.

This year there is but one foreign competitor—Norway's Capt. Christie, flying a D.H. Leopard Moth

Holding the National Air Races over such a short course (it is shown above) is a new venture. The basic reasons for making the change were given in some detail in *Flight* of January 9th this year. Briefly, they are that expense for competitors is much reduced and radio equipment can remain optional; difficulties in regard to flying through controlled areas are obviated (especially in regard to I.F.R. conditions suddenly descending when aircraft are spreadeagled around a long course); and the paying public, on whom the whole future of such events depends, is most likely to get its money's worth—at least so long as relatively slow aircraft



The short (ten-mile) course is a near-rectangle.

THE GROSVENOR CHALLENGE CUP RACE
(Aircraft capable of up to 130 m.p.h.)

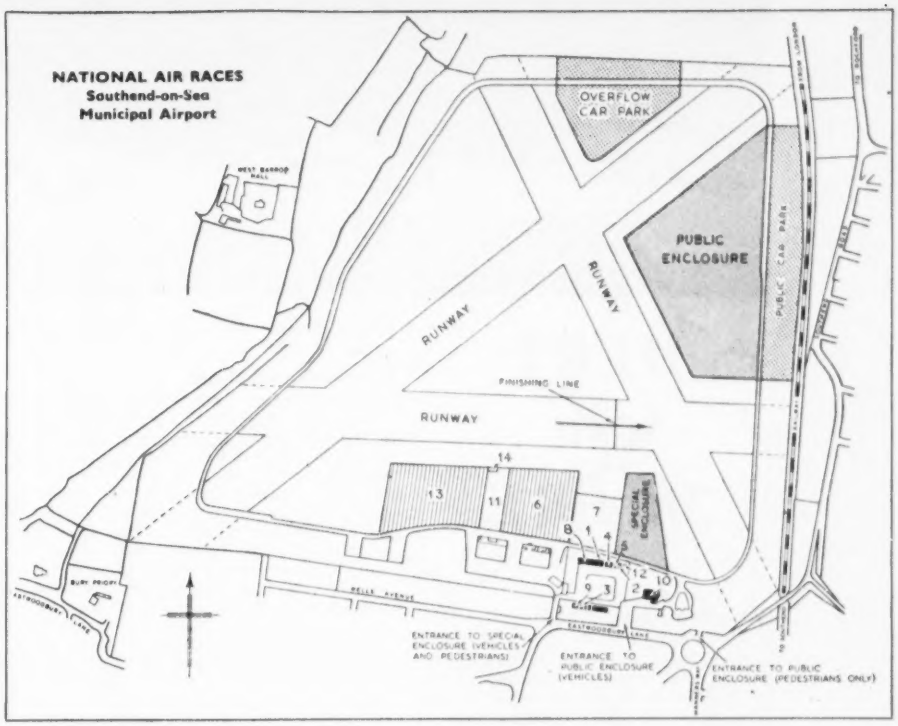
No.	Entrant	Pilot	Aircraft	Engine	Reg.
1	Dr. W. L. James	Entrant	Chilton D.W.1	Carden Ford	G-AESZ
12	C. Gregory	Entrant	T'craft Plus D	Cirrus Min. 1	G-AHGZ
13	B. G. K. Maile	Entrant	T'craft Plus D	Cirrus Min. 1	G-AHSB
20	D. R. Robertson	Entrant	Moth Minor	Gipsy Min.	G-AFPN
21	Capt. D. M. Spencer-Smith	Entrant	Tiger Moth	Gipsy Maj. 1	G-ALSH
22	S/L. P. E. Hindmarsh	D. F. Ogilvy	Moth Major	Gipsy Maj. 1	G-ADHE
23	F. A. Laker	J. R. Batt	Autocar	Gipsy Maj. 1	G-AMFP
25	C. R. Purley	G. A. Farley	Autocar	Gipsy Maj. 1	G-AJYY
26	A. N. Spriggs	S/L. N. F. Duke	Tomtit	Mongoose 3C	G-AFTA
28	E. W. Westbrook	Entrant	Messenger 4A	Gipsy Maj. 1D	G-ALBE
36	N. M. Browning	Entrant	Messenger 4A	Gipsy Maj. 1D	G-AKZX
40	Capt. J. H. Christie	Entrant	Leopard Moth	Gipsy Maj. 1	LN-TVT

THE NORTON-GRIFFITHS CHALLENGE TROPHY RACE
(Aircraft capable of 130-150 m.p.h.)

No.	Entrant	Pilot	Aircraft	Engine	Reg.
30	K. M. Freeman	Entrant	Hawk Tr. 3	Gipsy Maj. 1	G-AIYD
35	W. P. Bowles	Entrant	Messenger 2A	Cirrus Maj. 3	G-AJYZ
37	C. H. Bennion	C. W. W. Turner	Messenger 2A	Cirrus Maj. 3	G-AJFH
39	D. C. Jemmett	Entrant	Hawk Tr. 3	Gipsy Maj. 1C	G-AKPE
41	Sir Frank Spriggs	G. F. Bullen	Miles Whitney Straight	Gipsy Maj. 1	G-AEUJ
45	Miss F. M. Leaf	Entrant	Hawk Maj.	Gipsy Maj. 1	G-ACYO
46	A. J. Spiller	Entrant	Leopard Moth	Gipsy Maj. 10-2	G-ACMA
54	W/C. C. A. Pike	W. P. I. Fillingham	Chipmunk 1	Gipsy Maj. 10C	G-AKDN
68	S/L. J. A. R. King	F/O. M. R. T. Chandler	Hawk Tr. 3	Gipsy Maj. 1	G-AKRV
76	D. J. Bennett	Entrant	Proctor 5	Gipsy Queen 2	G-AHWU
77	R. Blackburn	G. R. I. Parker	Proctor 5	Gipsy Queen 2	G-AHWR
88	H.R.H. Prince Alexander of Jugoslavia	Entrant	Proctor 5	Gipsy Queen 2	G-AMTJ

THE KEMSLEY CHALLENGE TROPHY RACE
(Aircraft capable of over 150 m.p.h.)

No.	Entrant	Pilot	Aircraft	Engine	Reg.
31	G. Marler	Entrant	Falcon Six	Gipsy Six 1	G-ADTD
69	H. J. G. Turner	Entrant	Proctor 3	Gipsy Queen 2	G-AIKJ
71	P. G. Lawrence	Entrant	Proctor 1	Gipsy Queen 2	G-AHVG
72	W/C. R. H. McIntosh	Entrant	Proctor 1	Gipsy Queen 2	G-AHGA
73	A. S. K. Paine	Entrant	Proctor 1	Gipsy Queen 2	G-AHNA
78	J. P. Crowther	Entrant	Proctor 3	Gipsy Queen 2	G-AKWV
91	T. O. M. Sopwith	F. Murphy	Hart	Kestrel 16	G-ABMR
93	G/C. C. M. M. Grece	Entrant	Nighthawk	Gipsy Six 2	G-AGWT
94	F. Dunkerley	Entrant	Gemini 1a	2 Cirrus Minor 2	G-AKKB
95	S/L. J. Rush	Entrant	Falcon Six	Gipsy Six 1	G-AECC
96	R. R. Paine	Entrant	Hawk Speed Six	Gipsy Six 1F	G-ADGP
97	J. N. Somers	Entrant	Mew Gull 2	Gipsy Six 2	G-AEXF



Layout of the enclosures and other features at Southend Airport for June 20th.

(1) Race H.Q.
(2) Air traffic control.
(3) Airport manager's office.
(4) Briefing room.
(5) Clerk of the course.
(6) Competing aircraft.
(7) Customs area.
(8) Customs buildings.
(9) Press office.
(10) Restaurant (reserved).
(11) Servicing bay.
(12) Stewards' office.
(13) Visiting aircraft.
(14) Visiting pilots report here.

are concerned—by having what might be termed a grandstand view of an aerial speedway circuit.

With a view to attracting the maximum number of spectators, prices of admission have been kept to a modest level, and the organizers point out, also, that appreciable reduction in expense, and in time taken in gaining entry to the airfield, can be effected by purchasing tickets in advance. Prices for spectators arriving by road vehicle are given below (reduced figures on advance booking are in parenthesis); in every case the prices comprise inclusive charges for admission of vehicle and all passengers, together with parking fee. Details are: Motor cycles, all types of power-assisted bicycles, three-wheeled vehicles—7s 6d (5s); cars regardless of seating capacity—15s (10s); coaches—£5 (£4); double-deck coaches—£8 (£7). Ample parking space is available, and route diagrams and windscreen stickers will be supplied free to those taking up advance bookings. Such bookings should be made through the Corporation Transport Manager, 95 London Road, Southend-on-Sea.

For spectators not using vehicles, the entry fee will be 2s 6d, or 1s for children between six and twelve years of age. Licensed-catering arrangements have been made.

FERRYING THE CORONATION FILMS

OPERATION *Pony Express*, the name given to the arrangements made by the R.A.F. for ferrying television films of the Coronation to Canada, was put into effect on the great day and, barring one small hitch, all went according to plan. The Air Minister subsequently sent a message to Air Marshal G. H. Mills, C.B., D.F.C., A.O.C.-in-C., Bomber Command, congratulating all concerned on their achievement.

Two Fighter Command Sycamore air/sea rescue helicopters, flown by F/L. D. Kearns and F/O. F. Bernard, carried the batches of films to London Airport, from a cricket pitch alongside Alexandra Palace, taking about nine minutes over the journey. Here one B.2 and three P.R.3 Canberras were waiting, one of the P.R.3s—rather than the B.2 as intended—being designated reserve aircraft due to its having developed an unusually great thirst for fuel at the last minute.

The B.2, flown by S/L. W. N. Kenyon, with S/L. H. J. Shield, D.F.C., as navigator, took off at 1336 hr and reached Goose Bay, 2,480 miles away, at 1845 hr B.S.T. (1345 hr Eastern Time). Here the recordings were transferred to an R.C.A.F. CF-100, which flew them 816 miles to St. Hubert's, the R.C.A.F. airfield just outside Montreal, in just under two hours—whence they were transported to the city by S-51 helicopter.

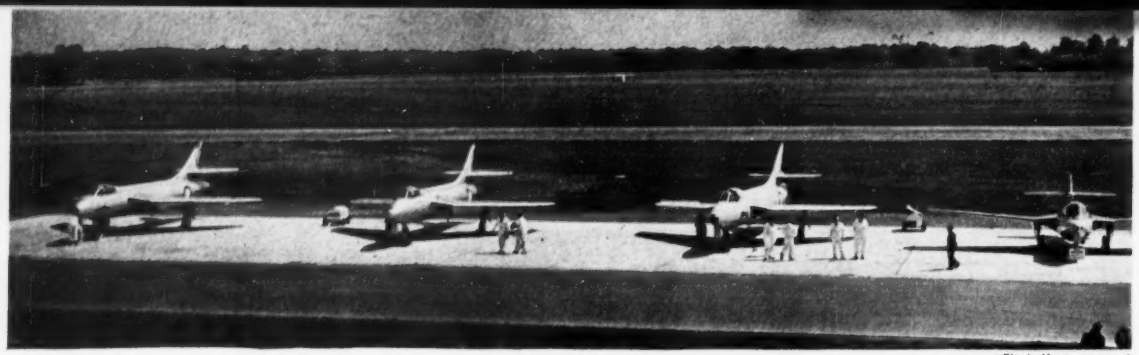
The first P.R.3, with F/L. F. Garside and F/L. N. E. Metcalfe aboard, took off at 1516 hr with the second batch of films. Unfortunately, a fault developed in the radio compass, and the crew had to return to London Airport, from which they took off again, with minimum delay, in the fuel-thirsty reserve aircraft; they topped-up their tanks at Aldergrove, and landed at Goose Bay at 2247 hr B.S.T. The final P.R.3, flown by a Canadian, F/L. S. P. Gulyas, with F/L. R. F. Hiller as navigator, reached Goose at 2343 hr B.S.T. The second and third batches of film were relayed on to St. Hubert's by another CF-100 and the B.2 Canberra, and thence taken to Montreal by the S-51.

As a result of these arrangements, the first shots of the Coronation ceremonies were visible in Canada over the C.B.C. network at 1615 hr Eastern Time, and the same pictures were relayed simultaneously to America *via* A.B.C. and N.B.C.—which latter had a loose mutual arrangement with the Canadian company that both should share whichever films arrived first, either *via* R.A.F. Canberra or possibly by any of the other aircraft mentioned below.

All scenes inside the Abbey had been taken exclusively by B.B.C. operators, and it was recordings from the B.B.C. telefilm, coupled with other external shots, that had this first showing in the New World: the Canberras, however, brought over additional films, taken by a number of other American companies, of the procession and of the Palace balcony, and N.B.C. and C.B.S. flew their shots 900 miles from Goose to Boston in chartered Mustangs. These were not seen by American viewers until after the broadcast from Montreal had started, owing to the superior performance of the CF-100s and Canberra B.2 *en route* from Goose.

Possibly the most interesting story of all, however, was one that ended in failure. As long ago as last autumn, within 48 hr of the double Atlantic crossing, N.B.C. approached English Electric to examine the possibility of flying films across the Atlantic, and—through the courtesy of the Venezuelan government—it proved possible for N.B.C. to organize the delivery flight of a Venezuelan Canberra for June 2nd. Films of the first phase of the Coronation ceremony, up to the moment when the Queen entered Westminster Abbey, were rushed to Croydon, hastened to Blackbushe by Dove, and carried aboard the Canberra in which Capt. J. W. Hackett and Mr. P. Moneypenny, of Silver City Airways, were sitting ready to take-off. Alas, with one-third of the journey accomplished, Hackett found that the fuel from his extra (ferry) tank would not feed to the engines. Suspecting an air bubble, he dived from 40,000 to 20,000 ft, and also tried standing the aircraft on its tail—but all to no avail. A quick calculation showed he would run out of fuel 100 miles short of Gander if he carried on, so there was no option but to return—and at base the trouble was soon diagnosed as a faulty pump. The pity of it was that, if the unusually favourable meteorological conditions prevailing up till the time of turn-round had continued, he might conceivably have been able to fly direct to Boston, by-passing the short refuelling halt at Gander, and thus achieve the first non-stop U.K.-U.S.A. flight by a jet aircraft. If the plan had succeeded, N.B.C.—and therefore maybe C.B.C. as well—would have had the procession showing three to four hours before their earliest rivals.

N.B.C. and C.B.S., between whom there is very keen rivalry, made assurance still more sure by each chartering commercial aircraft as "flying news-rooms," complete with cine editing equipment. N.B.C. chartered a DC-6B from Pan American World Airways; the machine made a dramatic take-off from London Airport at 1312 hr B.S.T., and flew non-stop to Boston in 12¼ hr, arriving an hour ahead of schedule and delivering its edited cargo in time to be added to the films that had travelled by Canberra and Mustang. C.B.S. chartered a B.O.A.C. Stratocruiser which left London Airport at 1300 hr B.S.T. and arrived in Boston 14 hr 52 min later, having refuelled at Gander. The films it carried were "on the air" eight minutes later.



"Flight" photograph

RELATIONSHIPS: The line-up of Hawker fighters referred to ("Lineal Development") below.

HERE AND THERE

Woomera's New Chief

SUCCESSOR to Mr. H. C. Pritchard, who is returning to England, Dr. Christopher Bareford has arrived in Australia to take up the duties of superintendent of the Long-range Weapons Establishment at Woomera.

Honorary Doctorates

LORD TEDDER, Chancellor of the University of Cambridge, recently conferred honorary degrees of Doctor of Science on Sir John Cockcroft, Director of the Harwell atomic-research station, and Sir Frank Whittle, of gas-turbine fame.

Sweden's Big Fly-past

JUNE 6th is Sweden's national day, and the occasion was particularly noteworthy this year in that Stockholm is celebrating its 700th anniversary as a city. To mark the occasion, 700 military aircraft, mostly jet fighters, flew over the capital, and two relatively new Saab aircraft, the J-29 fighter and the type 210 delta-wing Draken research aircraft, were among the machines demonstrated. The Lansen did not appear.

Fast Ferrying

INCIDENTALLY, enjoying some measure of compensation for their bad luck with the Coronation films (see p. 743), Capt. J. W. Hackett and Mr. P. Moneypenny, of Silver City Airways, succeeded in flying from Warton, Lancs, to Gander last Sunday in 4 hr 26 min on the first leg of their flight to deliver a Canberra to Venezuela. Average speed was 510 m.p.h., which beats the previous unofficial record of 492 m.p.h. set up last month by two other Canberras bound for the same destination.

Lineal Development

THE photograph above is an object-lesson in aircraft development. From a long line of Hawker fighters came the Nene-powered Sea Hawk, seen on the right. One of the swept-wing developments was the P.1067 standing alongside it, and this Avon-powered development was in turn followed by a Sapphire-powered version (second from left). The Service name of the Sapphire-engined machine is Hunter F.2, and, like the Avon-powered F.1 (the first production model of which is seen on the extreme left of the picture) is in super-priority production. Points noted on the production Hunter F.1, on the occasion of the recent visit to Dunsfold of H.R.H. the Duke of Edinburgh (described in *Flight* last week), were the tail navigation light housed in the tail-cone (this supplants twin lights flanking the tailpipe) and a suppressed aerial in the upper leading-edge of the fin.

On Show

FORTHCOMING exhibitions in London include the British Instrument Industries Exhibition (170 stands in the National Hall, Olympia), from June 30th to July 11th, and the Business Efficiency Exhibition (nearly 100 exhibitors), to be opened at Olympia by Sir Miles Thomas on June 16th and running until June 26th. Already in progress at the same venue—until June 18th—is the British Plastics Exhibition and Convention.

Giving the Wire

A NEW device for detecting aircraft fires has been developed by the Graviner Manufacturing Company. The Fire Wire, as it is called, consists of a stainless-steel hollow wire, down the centre of which runs another much thinner wire: between the two is a layer of a special heat-sensitive metal, the resistance of which decreases with increasing temperature. At a prescribed danger temperature, a current is thus enabled to flow from the inner to the outer wire, and so to operate a relay which in turn initiates a visual or aural warning. If temperature falls, the warning is automatically disconnected by the reverse sequence of operations. The wire can be divided into sections, each connected to a different warning device. The system has already been tried on several British aircraft, including the Comet and Viscount. The wire weighs one ounce per six feet, and a complete relay box 16 oz.

PRINCE BERNHARD of the Netherlands at the controls of the Blackburn Beverley, which, as we recorded last week, he flew during a visit to Brough on May 31st.

Northolt Attraction

UNTIL August 31st, visitors to the public enclosure at Northolt Airport will be able to see, without additional charge, an exhibition entitled "Shell and the Gas Turbine."

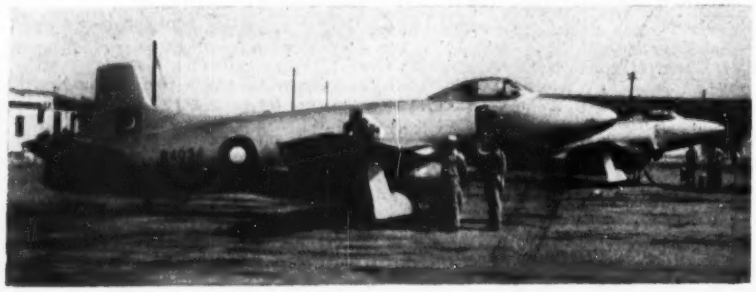
Cranfield Occasion

PRESENTATION DAY at the College of Aeronautics this year is Friday, June 26th. The presentation of diplomas will be made by Lord Hives, C.H., M.B.E., B.Sc., F.R.Ae.S., chairman and managing director, Rolls-Royce, Ltd., at a ceremony during the morning, and the presentation ball will begin at 10 p.m. the same evening. Information can be obtained from Mr. J. T. D. Holt, hon. secretary of the presentation-ball committee, at Lanchester Hall, Cranfield.

London to Belgrade by Eagle

ON Saturday last, June 6th, the first scheduled post-war service between London and Belgrade was flown by a Viking aircraft of Eagle Aviation, Ltd. (independent operators) carrying passengers, mail and freight. After taking off from Blackbushe at 1015 hr, and making an 80-minute stop at Munich, the aircraft arrived at Zemun airport, Belgrade, at 1740 hr. On the return journey, made the following day, a non-stop flight from Zemun to Blackbushe was made, taking 5 hr 35 min. Normally, stops will be made each way at Munich, and the service will be flown weekly. We hope to give, next week, some personal impressions of the inaugural flight.

IN TRANSIT: Attackers R4034 and R4035, among the last of the batch of 36 supplied to the Royal Pakistan Air Force, photographed at Nicosia, Cyprus, on their delivery flight.



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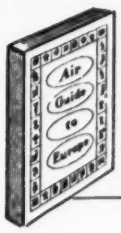
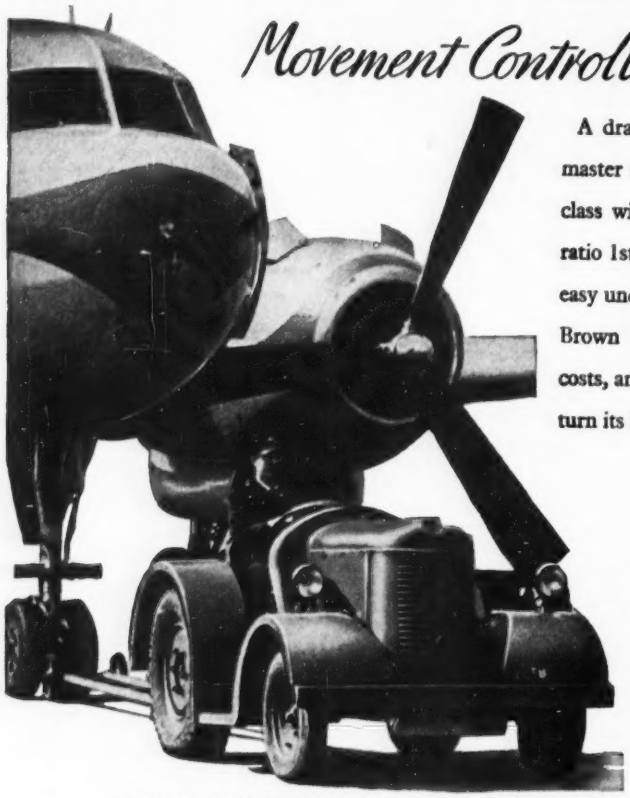


Newman Neame's
AIR GUIDE TO EUROPE
A 192-page guide to
Good times, food and wine
Hard-to-find facts
Money-saving hints
5/- from any bookseller

BRITISH EUROPEAN AIRWAYS

Movement Controlled-by the TASKMASTER



A drawbar pull of 3800 lb. enables the David Brown Taskmaster to handle aircraft up to the Convair, Viking, and Dakota class with ease and safety. The 4-speed gearbox with its low-ratio 1st gear equips the driver for full-power 'break-out' with easy under-way gear-shift to suitable working speed. The David Brown Taskmaster speeds up ground movement, lowers fuel costs, and although primarily designed for aircraft handling it can turn its hand to every conceivable haulage job around the airfield.

- ★ OHV ENGINE DEVELOPS 39 B.H.P.
- ★ 3800 LB. DRAWBAR PULL
- ★ TOP SPEED 22 M.P.H.
- ★ LARGE TYRES GIVE GREATER TRACTION
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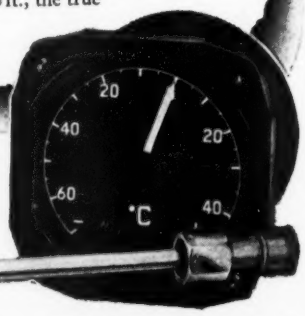
Flight Planning The air temperature is one of the most important factors in the operation of a long-range jet aircraft as it influences the rate of climb, the heights at which the aircraft will cruise, and hence the true airspeed. The latter in turn determines the specific range (air miles per pound of fuel) since within limits, fuel consumption per hour at the normal cruising altitudes does not vary much. It can be seen therefore that air temperature controls the choice of flight path, largely determines the fuel load carried, and governs the whole economy of the operation. The effect of air temperature on Comet operations can be illustrated by the fact that a 10°C. rise in temperature reduces the cruising altitude by 2,000 ft., the true airspeed by 13 knots, and the cruising specific range by 2%.



From the article "Operating the Comet" by D. O. MacDougall in the May issue of Shell Aviation News.

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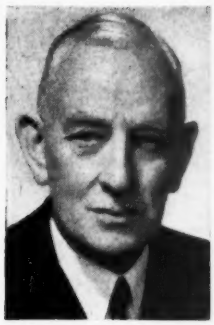
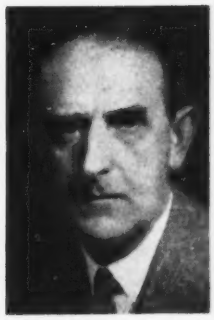


Sir P. Bennett (Baron)

T. O. M. Sopwith (Kt.)



Sydney Camm (Kt.)

W. R. Verdon Smith (Kt.)

E. T. Jones (C.B.)

CORONATION HONOURS

LAST week we recorded the names—available as that issue closed for press—of a number of civilian recipients of honours conferred by the Queen on the occasion of her Coronation; and Service honours were listed *in extenso*. It is now possible to give, below, a list which includes the names of many more recipients who are members of the industry or who are in other ways connected with aviation. It will be seen that among them, in addition to those mentioned last week, are Sir Peter F. Bennett, joint managing director of the Joseph Lucas Industries, who is made a Baron; Mr. W. R. Verdon Smith, the Bristol Aeroplane Company's joint managing director (Knight Bachelor); and Mr. W. Hudson Fysh, founder, chairman and managing director of Qantas Empire Airways (K.B.E.). Additional Service honours are given on page 765 of this issue.

BARON

Sir Peter Frederick Blaker Bennett, M.P., joint managing director, Joseph Lucas Industries, Ltd. (for political and public services).

KNIGHTS' BACHELOR

E. C. Bullard, director, National Physical Laboratory, D.S.I.R.; Sydney Camm, director and chief designer, Hawker Aircraft, Ltd.; D. E. Griffiths, vice-chairman of the Executive Committee, R.A.F. Cinema Corporation; Hon. F. J. Hopwood, managing director, Shell Transport and Trading Co., Ltd.; T. O. M. Sopwith, for services to aircraft production; W. R. Verdon Smith, joint managing director, Bristol Aeroplane Co., Ltd., for public services in Bristol.

ORDER OF THE BATH

K.C.B.

Sir J. D. Cockcroft, chairman, Defence Research Policy Committee, Scientific Adviser to Ministry of Defence and Director of the Atomic Energy Research Establishment.

C.B.

A.V-M. W. A. B. Bowen-Buscarlet, chairman, E. Lancs. T.A.F.A.; R. Cockburn, Scientific Adviser, Air Ministry; E. T. Jones, Principal Director of Scientific Research (Air), M.o.S.

ORDER OF ST. MICHAEL AND ST. GEORGE

C.M.G.

J. Durward, deputy director, Meteorological Office, Air Ministry; R. E. Hardingham, secretary and chief executive, Air Registration Board.

ORDER OF THE BRITISH EMPIRE

K.B.E.

W. Hudson Fysh, chairman and managing director, Qantas Empire Airways, Ltd.

C.B.E.

F. S. Barton, Principal Director of Electronic Research and Development, M.o.S.; W. J. Duncan, Professor of Aeronautics and Fluid Mechanics, University of Glasgow; A. Fage, superintendent of aerodynamics division, N.P.L.; N. A. Gass, a managing director, Anglo-Iranian Oil Co., Ltd.; A.V-M. M. Henderson (rtd.), director-general, Overseas League; K. C. Mann, Director of Works (Overseas), Air Ministry; C. W. Moss, director, Vickers-Armstrongs, Ltd.; C. S. Smallman, Director of Accounts, M.C.A.; J. Summers, chief test pilot, Vickers-Armstrongs, Ltd., 1929-51.

O.B.E.

Capt. M. J. R. Alderson, Comet Fleet manager, B.O.A.C.; W/C. R. P. Beamont, chief test pilot English Electric Co. Ltd.; A. C. Best, principal scientific officer, Meteorological Office, A.M.; G. B. Bolt (for services to aviation in New Zealand); J. G. Bullen, general manager, Highland Reduction Works, British Aluminium Co.; C. F. Burden, Deputy Director of Aeronautical Inspection, Air Ministry; C. Chambers, chief engineer, Fighter Command, R.A.F.; H. J. Curnow, Assistant Director of Aircraft Production Supply (Materials), M.o.S.; H. P. Finch, aerodrome commandant, M.C.A.; G. H. M. Miles, chairman, executive committee, Association of British Aero Clubs and Centres; C. J. Pridmore, administrative officer, Maintenance Command, R.A.F.; J. H. Tanner, chief aviation officer, Tanganyika; Capt. L. M. Thompson, manager and chief test pilot, Bahamas Airways; H. J. H. Wassell, chief radar development engineer, Marconi's Wireless Telegraph Co., Ltd.; C. T. Wilkins, assistant chief designer, de Havilland Aircraft Co., Ltd.

M.B.E.

W. G. Allen, senior experimental officer, Directorate of Electronics Research and Development (Air), M.o.S.; A. Anslow, production manager, J. Sankey and Sons, Ltd., Wellington, Salop; H. S. Atkinson chairman of committee, No. 135 (Reigate and Redhill) Sqdn., A.T.C.; A. H. Blackwell, director and works manager, David Brown Tractors (Engineering), Ltd.; J. McG. Bowes, hon. secretary, Rolls-Royce, Ltd., Glasgow, savings group; A. E. Cotton, deputy superintendent, Directorate General of Works, Air Ministry; S/L. W. H. Dunton, civilian officer, R.A.F. School of Photography; W. J. M. Gladden, higher executive officer, Air Ministry; K. H. Greager, chief engineer, Central African Airways; H. F. Griggs, senior executive officer, M.C.A.; H. J. A. Hill, sales manager, London, B.E.A.; V. A. Hinde, higher executive officer, M.C.A.; W. B. J. A. Keppel, operations officer, Dept. of Civil Aviation, Nigeria; G. King, senior res. chemist, Albright and Wilson, Ltd.; A. H. Laidlaw, chief draughtsman, Vosper, Ltd., Portsmouth; R. H. Linnell, radar factory supt., British Thomson-Houston Co., Ltd., Leicester; Obs. Cdr. F. W. Mitchell, Deputy Commandant, Southern area, R.O.C.; F. J. Mulrooney, Secretary of the Air Board, Australia, 1939-52; Obs. Cmdt. H. G. Newman, Commandant, No. 15 Group, R.O.C.; H. N. Peake, chairman, Banbury Committee, A.T.C.; G. A. H. E. Poole, factory manager, Joseph Lucas, Ltd., Birmingham; E. F. Spillan, telecommunications technical officer, M.C.A.; J. W. Strydom, cashier, Vacuum Oil Co., Coryton refinery (for services during the recent floods); W. H. Tichbon, chief inspector, B.O.A.C. (Bristol); H. P. D. Van Asch, for services to civil aviation (espec. air survey) in New Zealand; F. G. V. Vincent, plant engineer, Supermarine Works, Vickers-Armstrongs, Ltd., Swindon; Mrs. D. Walker, controller of typists (outstations), A.M.; J. W. Walker, senior executive officer, Air Ministry; V. Whitaker, senior technical superintendent (Engineering) No. 10 Maintenance Unit, R.A.F. Hullavington; F. B. Wilson, technical adviser, Guest, Keen and Nettlefolds (Midlands) Ltd., Darlaston.

QUEEN'S COMMENDATION FOR VALUABLE SERVICE IN THE AIR

Capt. R. Rymer, Training Captain, Viscount Flight, B.E.A.

BRITISH EMPIRE MEDAL

A. J. Abbott, foreman, Rotax, Ltd.; A. Ball, electrical section-leader, Saunders-Roe, Ltd., Cowes; Miss H. Davies, forewoman, Simmonds Aerocessories, Ltd., Treforest; W. V. Furness, chief observer, R.O.C., Manchester; C. Grout, crane driver, R.N. Air Station, Lee-on-Solent (for services in the floods); J. W. Kyle, radio mechanic Grade 1, telecommunications section, M.C.A.; R. H. Massey, station warden, R.A.F. Station, Pembroke Dock; E. Shimon, clerk Grade I, R.A.F. Levies, Iraq; T. B. Strong, foreman of trades, R.A.F. Station, Hawarden; J. Whyman, shop foreman, R.A.F. Station, Quedgeley.

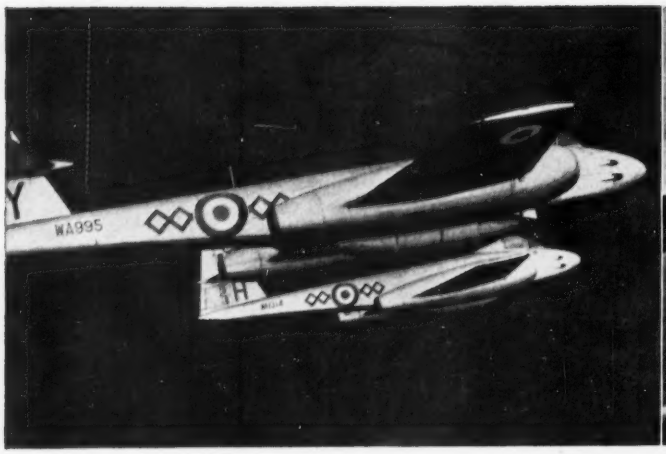
R. E. Hardingham (C.M.G.)

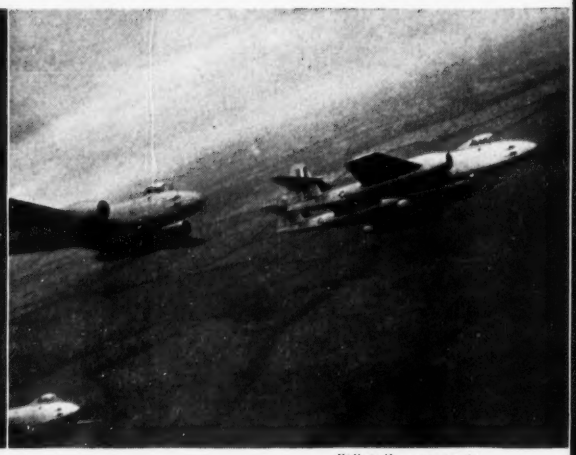
Hudson Fysh (K.B.E.)

Capt. J. Summers (K.B.E.)

Capt. M. Alderson (O.B.E.)

W/C. R. P. Beamont (O.B.E.)





"Flight" photographs

CORONATION DAY

R.A.F. on Ceremonial Duty: The Fly-past as seen from a Participating Meteor 7

JUDGED by any standard, the drill and marching of the R.A.F. contingents in the Coronation processions were quite magnificent. Though their uniforms (except those of the bandsmen) were outshone in sheer splendour by those of other Services, yet the files of light blue, relieved by white rifle-slings and belts, gave a singular impression of neatness and smartness.

Anyone who, like the writer, was installed outside Buckingham Palace must have been very deeply impressed when the R.A.F. detachment took position before the Palace in company with the Guards and the Royal Navy, and when the Central Band, their instruments blending with the gold facings of their tunics, struck up the National Anthem as the State Coach emerged.

The various personages and units of the flying Services, and their order in the processions, were listed in our previous issue. On the great day all concerned bore themselves splendidly. Neither teeming rain nor long periods of waiting ruffled them or in any way detracted from their deportment.

In the fly-past the pilots of Fighter Command and the R.C.A.F. contended with the weather in the most resolute and worthy manner. As the last formation passed the Palace strong paraffin fumes—unquestionably from the aircraft—were borne on the wind over the crowds, which were then beginning to break the cordons and stream in towards the Palace.

A second member of *Flight's* staff was flying in the leading wing of Meteors. For the Duxford wing (he writes) the moment when the Palace came into view and we flew across the Mall was a part, the most significant part, of a well-rehearsed and precisely timed flight—and an extremely rough one, thanks to the weather.

Some two hours previously the pilots had attended the final briefing. With the route and timing well known from the several rehearsals, the weather was obviously the one factor that mattered, for it was still uncertain that the fly-past would actually take place.

As W/C. J. Wallace, D.S.O., D.F.C. (C.O. of the Duxford Flying Wing), who was to lead the wing—and the entire fly-past—rose to begin the general briefing, a messenger entered to report a large cu-nim over Biggin Hill (directly on the route) and the possibility of having to fly round it. "Anyone want a good watch?" inquired W/C. Wallace.

He went on to describe the weather encountered on his advance flight over the route earlier that afternoon. "London is right under this cu-nim thing," he continued, "and unless it moves there is not much hope of performing the fly-past in the original massed form." There were two alternatives, the "modified mass," with 30-second intervals before and after the Canadian Sabres; and the bad-weather routine, in which each of the seven wings (in line astern) would be separated by the same 30-second interval. It was not known which procedure would be used.

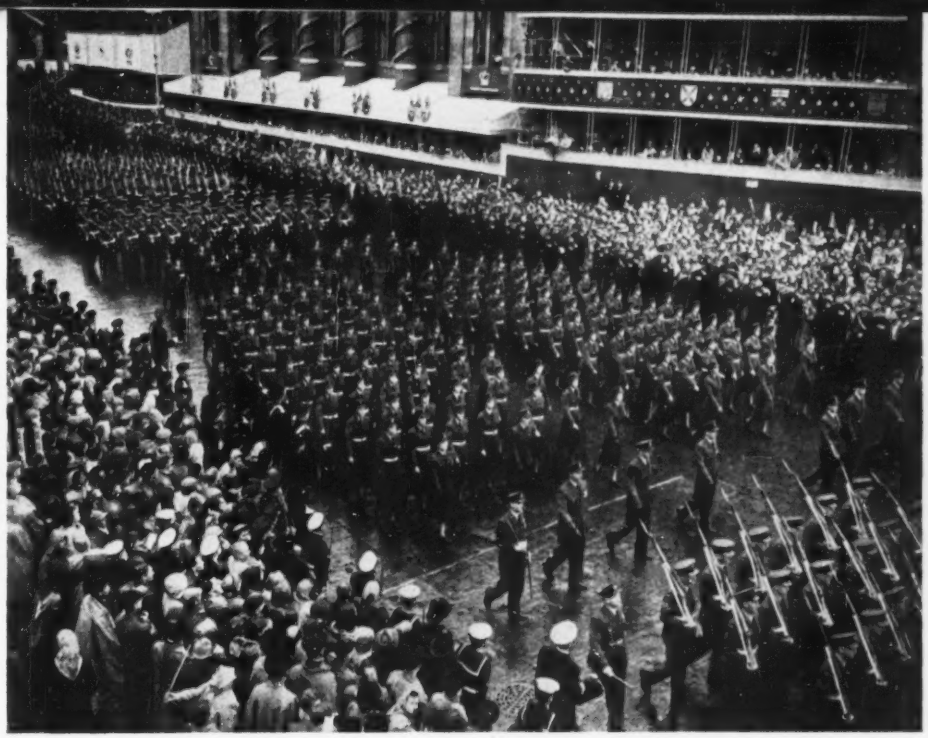
In spite of very difficult weather, the R.A.F. made its fly-past salute to the Queen on Coronation Day. On the right the royal party is seen watching the fly-past from the Palace balcony, while above are two photographs taken by "Flight's" representative, who flew with the leading Meteor wing, during the flight to London.

Radio call-signs, assistance and distress procedures, general organization, and the aids available for the final run-in were then described. Useful gen on local conditions was to be transmitted by G/C. P. C. Wykeham-Barnes (Wattisham C.O.), flying the route in reverse shortly before the scheduled fly-past time, which had been put back 25 minutes due to delays in the Coronation procession itself. D/F. bearings were to be transmitted from Biggin Hill and the special installation in Regent's Park (referred to in *Flight* last week), while ground flares were to point a visual track on the final run-in.

Shortly before the start-up time of 1705 hr we heard that the bad weather formation would be flown. Then out to the aircraft, rain-soaked as the airfield itself was, in a strong wind with, above, the low, unfriendly cloud-base. I was to fly in the Mk 7 machine flown by P/O. John Heard, fourth Meteor in the leading flight of the second squadron. The Derwents were smoothly started, and I looked to the right, along the line of the other machines—Meteor 8s—of 64 and 65 Squadrons, to where the red tail of the fly-past leader and the red rudders of 65 Squadron's flight commanders stood out sharply.

Over the R.T. came the readiness check of all machines, flight by flight, and then the taxying-out of the first squadron, looking, in head-on view, like a row of large-eyed insects as they approached. The machines of 64 Squadron followed, and we lined up, close-packed on the runway, 28 machines in all (including two spares for each squadron). After a 30-second warning, the signal "go" was given, engines were opened up, and the Meteors took off in pairs, at three-second intervals.

The blast from the jets blew the rain fiercely back along the



Swinging into Trafalgar Square on the return from Westminster Abbey to Buckingham Palace are (right to left) personnel of the Royal Auxiliary Air Force, the Royal Air Force Reserve of Officers, the Women's Royal Air Force, Princess Mary's R.A.F. Nursing Service, the R.A.F. Police and R.A.F. Regiment. They are followed by the overseas commands.

runway as the first machines accelerated away. Then we were rolling, too, increasing speed with "A Able" on our left, and then staying low after take-off, to climb up and join the first two members of our flight in a wide turn to port. Leading our squadron was S/L. H. Bennett, and we were soon tucked in behind and below his Meteor, as F/L. Spiers to port and F/L. Young to starboard brought their flights in and formated on us.

Cruising at 1,200ft, we were just below the murky cloud-base as we headed towards North Weald. Our speed was 380 kt and the ride promised to be a bumpy one. On over Canvey Island and Thames Estuary towards Canterbury, feeding-in point for the the various wings, course and speed alterations for "Kodak One" (the first wing) coming at intervals over the R.T. A starboard turn at Canterbury, and we headed south towards Dungeness, cruising now at 320 kt as the wings behind us gradually joined up. Station-keeping in the bumpy weather was obviously not easy; attendant Meteors lunged up and down, and the writer's ball-point pen descended, to his dismay, into the belly of the Mk 7.

From Dungeness we turned across the palely-glinting water to Hastings pier, and along to Bexhill, where the final run-in began. From here on, D/F. bearings were repeatedly given; times had been checked on passing over the turning points, and speed alterations were made to ensure arriving on time.

Biggin Hill passed beneath, an orange flare burning on a runway, and ahead lay the line of final flares for the last stages of the approach run. The dark green fields and trees gave place to the built-up areas of south London, while over the R.T. came a Canadian voice, "Kodak Four. Over Biggin. On time." A final E.T.A. was given by W/C. Wallace to "Buckingham"—code name of A.V-M. the Earl of Bandon, A.O.C. No. 11 Group, who controlled the fly-past from the roof of Buckingham Palace, and the visibility worsened as the line of the Thames came into view.

Over Westminster, the Abbey, at 1,200ft, and then on our left Buckingham Palace itself, located by the white arcs of the stands in front of it, and by the line of the Mall. Little detail could be picked out before the Palace was seemingly swallowed by our port Derwent. For those on the ground, and on the Palace balcony, the R.A.F.'s salute to the Queen was beginning. For the Meteors of the Duxford wing it was over, accomplished with precision in spite of appalling weather.

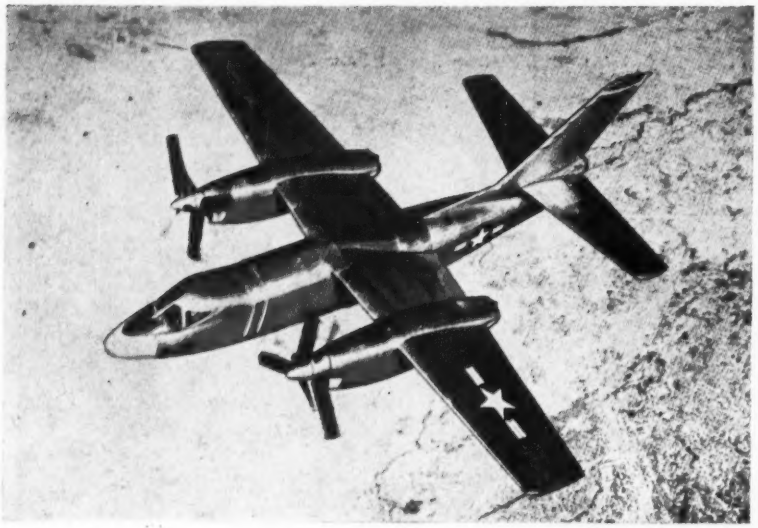
Overseas, the Queen's Air Forces marked the day with ground and air demonstrations. In Ottawa there was a fly-past of 100-140 aircraft, representing almost every type in service with the Regular Air Force. They included Sabres, Canucks, Dakotas, Lancasters, North Stars, Harvards, Expediters and T-33s. In the lead was an Otter.

In Berlin a wing of the Royal Air Force Regiment participated in the ceremony of Trooping the Colour; in Dusseldorf 156 aircraft of R.A.F. and Belgian Air Force squadrons—including Sabres—flew past; and in Cyprus the letters "ER" were formed by R.A.F. machines over Nicosia.

Highlight in the Middle East Air Force during Coronation week was an air display at Deversoir, where some 15,000 British civil and military spectators attended.

[*An account of the flying of the Coronation films to North America appears on another page of this issue.*]

AIRCRAFT INTELLIGENCE



NEW FOR THE NAVY: The North American XA2J-1 Savage (top) is seen at altitude for the first time. Just getting airborne is the McDonnell F3H-1 Demon, which, like the new Savage, may be built in quantity for America's new carriers. Both types are referred to on this page.

Great Britain

M.L. Aviation U 120D. An early model of this small radio-controlled target aircraft was exhibited at the last S.B.A.C. Display, and it has just been announced that experts of M.L. Aviation have recently returned from the North African desert after tests with a number of these machines. Extensive quantity production is expected.

The target is to be used for training anti-aircraft gunners and is powered with a Vincent Picador two-cylinder engine. It is expendable in the sense that, should it be hit, it is destroyed; but if the gunners miss, it continues to fly until it runs out of fuel. A parachute then opens automatically and lowers it to the ground. Flotation gear will keep it afloat in case of a descent into the sea.

The U 120D has straight wings and a butterfly "tail". It is launched by two 3in rockets and measures 12ft both in length and span. The cruising speed is a little over 200 m.p.h. at heights up to about 20,000ft. Its small size enables the gunners to tackle it as though it were a much bigger aircraft flying much higher and faster. Its endurance is 45 min, and it has been designed for a total life of 10 hr.

France

S.N.C.A.S.E. Armagnac. As was to be expected, not all the Armagnacs will go into service with Air France and T.A.I. One, at least, is being equipped as a flight-test aircraft for the big S.N.E.C.M.A. Vulcain turbojet, two of which will be mounted on the wing—presumably underneath, between the main engines—so making the big aircraft a six-engine machine, with 14,000 h.p. and 20,000 lb thrust available.

Jet Aircraft Types. The following is a list of jet aircraft already built and flown in France. In each instance the date of the first flight is given in parenthesis.

Experimental aircraft: S.O.6000 Triton (11.11.46); Leduc O.10 (21.10.47); S.O.M2 (13.4.49); Fouga Sylphe (14.7.49); Nord 1601 (24.1.50); Fouga Cyclope (31.1.51); Fouga Gemeaux (6.3.51); Leduc O.16 (2.5.51); Dassault 450.30L (21.1.52); S.O.9000 Trident (2.3.53); Leduc O.21 (16.5.53—first composite flight).

Civil aircraft: S.O.30 Nene (15.3.51); S.O.1120 Ariel (18.4.51); SIPA 200 Minijet (14.1.52); Fouga Midjet (30.5.52); S.O.30 Atar (27.1.53).

Land-based military types: S.O.6021 Espadon (12.11.48); Dassault 450 Ouragan (27.2.49); S.E.2410 Grognard (30.4.50); Vampire (21.12.50); Dassault 452 Mystère II (23.2.51); S.O.4000 (15.3.51); S.E. Mistral (2.4.51); Dassault 453 Mystère de Nuit (18.7.52); Fouga 170.R Magister (23.7.52); Dassault 452 Mystère IV (28.9.52); S.O.4050 Vautour (16.10.52); Morane 755 Fleuret (29.1.53).

Carrier-borne naval types: Arsenal VG.70 (23.6.48); N.C.1071 (12.10.48); Nord 2200 (16.2.49); N.C.1080 (29.7.49); Arsenal VG.90 (27.9.49); Breguet 960 Vultur (4.8.51); Sea Venom (31.10.52).

Under construction or development are the S.E.210 Caravelle and Hurel Dubois HD.45 transports, and the S.E.5000 Baroudeur, a light tactical-support aircraft which takes off on a cradle and lands on two skids.

United States

McDonnell F3H-1 Demon. Shown on this page just after taking off from Lambert Field, Missouri, is the first production-prototype Demon which will shortly undergo carrier-suitability trials. The Demon first appeared three years ago, as a single-engined development of the XF-88 Voodoo Air Force fighter This first Demon was fitted with an engine of low power, but the current aircraft quite clearly has the production engine, the huge Westinghouse J40-WE-8, which is designed to produce 12,000 lb thrust with an afterburner. Poor development has seriously retarded this turbojet's production. Compared with earlier Demons the production machine shows greatly enlarged intakes, leading-edge flaps, tail bumper and variable-incidence tailplane. In production by both McDonnell and Temco, the Demon is to be the standard "transonic" carrier fighter of the U.S. Navy. It is presumably capable of supersonic speed.

North American XA2J-1 Savage. That the turboprop XA2J Savage is quite different from the piston-cum-turbojet AJ Savage is evident from the new flying view on this page. Powered by two Allison T40-A-6 double turboprops, driving six-blade paddle-type Aeroproducts airscrews, the XA2J has been fitted with leading-edge flaps. Further differences are the completely new fuselage with large bomb bay; the swept fin and rudder of great size; and the new undercarriage which retracts into the centre section, the nacelles being occupied by jet pipes. If the engines behave themselves the XA2J series is likely to be produced in quantity.

Republic Fighters. Although the two prototypes now being built by Republic differ greatly, both owe much to the XF-91. One is a delta-winged intercepter intended to replace the big Convair F-102. and capable of about Mach 2. This aircraft is likely to fly within a year and should weigh less than 10,000 lb. The other design is for a fighter/bomber, also with supersonic capabilities, weighing over 20,000 lb. These designs have the U.S.A.F. numbers XF-103 and XF-105, but which number refers to which aircraft is the subject of some confusion. One thing, however, is definite: about 90 per cent of the airframe of the XF-103 will be made from recently developed high-strength titanium alloys, the fabrication of which is now considered sufficiently well-known to warrant such extensive use.

Our American Correspondent Reports . . .

BACK in 1948 the American Society of Automotive Engineers (who take more than a passing interest in aviation engineering) held their autumn meeting in Los Angeles. This was just about the time that the news of British progress on turbine engines for commercial aircraft had begun to affect American thinking, although there were many who still didn't believe what they heard. But the subject of pure jet engines *versus* turboprops came up at this particular meeting, and the value of the latter type of power unit was hotly debated.

It was unfortunate for the American aircraft industry that just about that time they had had some very near fatal experiences with the airscrews on their current transports, so that when a representative of one of the leading West Coast manufacturers got up and condemned the airscrew as a method of supplying thrust (whatever the power unit) he got a sympathetic hearing. So persuasive were the arguments, in fact, that the turboprop was, to all intents and purposes, considered as a dead duck, and certainly something which the American manufacturers would do well to avoid (except, perhaps, for certain limited uses).

Partly as a result of this meeting, therefore, the emphasis on turbine-engine development for commercial purposes tended to be directed more towards the pure jet, and it remained for military requirements to lead commercial thinking back into the turboprop field. This may have been an expensive delay. Only now is there news of American turboprops which are really suitable for civil aircraft operations. Allison have had their T38 and T40 running for some years, it is true, but so far they have not caught the imagination of the operators. A more exciting prospect is the Pratt and Whitney T34, about which many good things are said. Wrights also have one or two projects in the development stage which could prove important, but the T34 is probably the most likely turboprop power unit for commercial work—anyhow for a few years yet.

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THIS recent revival of the turboprop has had repercussions in the airline field. It was quite understandable that as long as there were no American turbine engines ready for commercial work the enthusiasm for such transports would be at a minimum—despite British progress. But now that there is a good turboprop in the offing (even without an airframe) a change of heart is apparent in at least one important direction. During the last few years Mr. C. R. Smith, president of American Airlines, has, in his frequent speeches and Press conferences, always played down the turbine transport. He was, in fact, one of its most vigorous opponents. Recently, however, he made a speech in which he extolled the virtues of the turboprop (while still being very "bearish" about the pure jet). From this one may assume that American Airlines are taking a close look at such power units for their DC-7 replacements. As if to balance this development, however, Mr. Hall Hibberd (vice-president in charge of engineering at Lockheeds), came out, in a speech at San Francisco, more in favour, apparently, of the pure jet. He is reported to have said it would make a revolution in our concepts of travel and that jets exploded the belief that speed was uneconomical. He prophesied that pure jets (and turboprops) would cut both time and fares by considerable margins.

Nevertheless, it is not too surprising that there is still a lot of confusion in people's minds here as to the immediate value of the jet *versus* the turboprop *versus* the reciprocating engine. Some operators will have no part of turbines: some have Comets on order. One airline president upholds the turboprop, while a manufacturer lauds the jet. And when you combine this with a section of the industry who would still like to claim that turbine transports are dangerous, uneconomical, uncertifiable and Not Even Round the Corner, it's no wonder the public are bewildered!

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IF the Ministry of Civil Aviation reckon they have a noise problem out at London Airport, it's nothing compared with the one that faces the New York Port Authority. Although a horribly noisy person himself—particularly in a car—the New Yorker just hates it when it comes at him from the air. And when this is combined with a not unreasonable fear for his family's safety, a strong sense of his personal rights (to say nothing of an estate lobby, or eager lawyers), the combination is enough to frighten any aerodrome authority. And there is always the emotional approach to be considered. When trying to get its case before the proper authorities, the average British community is likely to employ "the recognized channels" all the way up from the local county council to the House of Commons. But not always so the New Yorker. If there were another serious aircraft crash into a built-up area around, say, Newark Airport, it's more than likely that there would be a mass-march of the population to close the airfield by force. And it might not be an accident that could lead to such drastic action. The noise of 50 jet flights a day—without proper prior education—could do the same thing. And that could become an international problem.

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THE latest book on aviation here is "The Amazing Mr. Doolittle," a biography by Quentin Reynolds, which will doubtless be published in England in due course. At the moment it is being widely advertised as "The *Amazing* Mr. Doolittle," with a photograph of the general, in uniform, standing in front of a B-25. This advertisement has more superlatives to the square inch than you could shake a stick at. "The superb story," "the fabulous flyer," "the daring first raid," "the gallant 8th Air Force," "the amazing saga," "the 5 foot 6 inch Superman," and so *ad nauseam*. The general gets so much publicity these days that this sort of thing probably no longer makes him wince. But this particular advertisement also carries two statements (which appear, of course, in the book) that might bear further historical research. In outlining his career it says, "He's the first man to take off and land entirely by instrument [no"s"] . . . the first to fly the outside loop . . ." The dates given in the book are September 24th, 1929, and May 25th, 1927, respectively. Have any students of history or ex-C.F.S. instructors any comments on this? I wonder that particularly, as the instrument flight in question was not a true solo flight—as was the first one in England—because Doolittle carried a safety pilot in the front seat.

As for the book itself, it contains a great many interesting stories, most of them of a personal nature, and told with considerable verve. It is a competent build-up for a remarkable man (as well as for the oil company he represents). But its appeal is likely to be limited, anyhow outside the United States; for in his endeavour to extol someone he admires, Mr. Reynolds has made the story too much like a strip cartoon. Which is not conducive to reading pleasure or to accuracy.

◆ ◆ ◆

A FINE old argument is boiling up here about the best method —and the safest—of installing jet engines in commercial transports. The Boeing Company, quite naturally, swear by the pod installation. It's better in every way, they say. Better aerodynamically, easier to maintain, safer and altogether A Better Thing. Not a bit, say the opponents, they don't want it at any price. What about the asymmetric flying qualities, suppose an engine *does* throw a blade, are you any better off? What happens if you have to land with the undercarriage up, and what about the aerodynamic conditions anyway? But the drive to accept this type of installation is on, and if the C.A.A. become convinced of its superiority, and write their regulations around it, it would be quite a problem.

ELECTRICALLY HEATED WINDSCREENS

AN informative booklet on the design and construction of aircraft windscreens that are heated electrically by means of conducting films has been compiled by Mr. J. H. Milsum, of the National Aeronautical Establishment, Canada.

Heating a windscreen not only results in the prevention of external icing and internal misting, but also affects the optimum shock-impact strength of the material. Most windscreens are laminated, i.e. they are made up of two lights of glass on either side of a layer of plastic, usually polyvinyl butyral; and 90 deg F is the optimum temperature for this type of laminate from the point of view of impact strength. Such a temperature is normally also sufficient to provide excellent anti-icing and de-misting characteristics.

In order to maintain a temperature of about 90 deg F electrically, a hard, thin, conducting film of a metallic oxide (usually stannic oxide) is sprayed on to the inside of the outer light of glass, and fired. If a polylaminated, bullet-proof screen is under construction, another heating film will normally be affixed on the outside of the innermost light. The transparency of the film is said to be excellent, being about 97 per cent, but electrical resistivity is on the high side: experiments are consequently being made in the United Kingdom with metallic films—at present gold —which are deposited by a vacuum-coating technique and give lower resistivities. Power required to give satisfactory heating is normally of the order of 1,500 B.Th.U./hr/sq ft.

The Royal Naval Review and Fly-Past

A Guide to the Carriers, Squadrons and Aircraft Taking Part

AT about 3 p.m. on Monday next, June 15th, Her Majesty the Queen and Admiral of the Fleet the Duke of Edinburgh will leave Portsmouth in H.M.S. *Surprise* and proceed to review the assembled fleet at Spithead. The passage of *Surprise* through the lines is expected to take about one and a half hours, and the full procession of reviewing ships about two hours.

At 5.30 p.m. will commence a fly-past of Naval aircraft over the fleet. This fly-past will be formed by two tributary streams whose routes are shown in the sketch-map below. Leading the fly-past will be eight Dragonfly sea/air rescue helicopters of No. 705 (Helicopter) Squadron, Gosport, which will come over in formation at about 80 kt.

These helicopters will have flown direct from their base, to which they will return after their fly-past. All other aircraft will be based on Lee-on-Solent, apart from the jets, which will operate from Ford. An exception to this arrangement has been made in the case of R.N.V.R. squadrons which, at the time of going to press, are expected to fly down from Culham. Once the helicopters are clear of the area the main fly-past will be made at about 180 knots, although speed will be adjusted as required to keep each squadron roughly the correct distance from its neighbours. The Ford-based jets will join the main stream shortly before reaching Spithead, and will cruise at some 300 knots.

Next will come a lone Sea Vampire of the Admiral's Flight, flown by Rear-Admiral W. T. Couchman, D.S.O., O.B.E., Flag Officer, Flying Training. He will be followed by the main body of aircraft, which will be ranged in groups of eight from each squadron; the following is the order in which they will pass Her Majesty :—

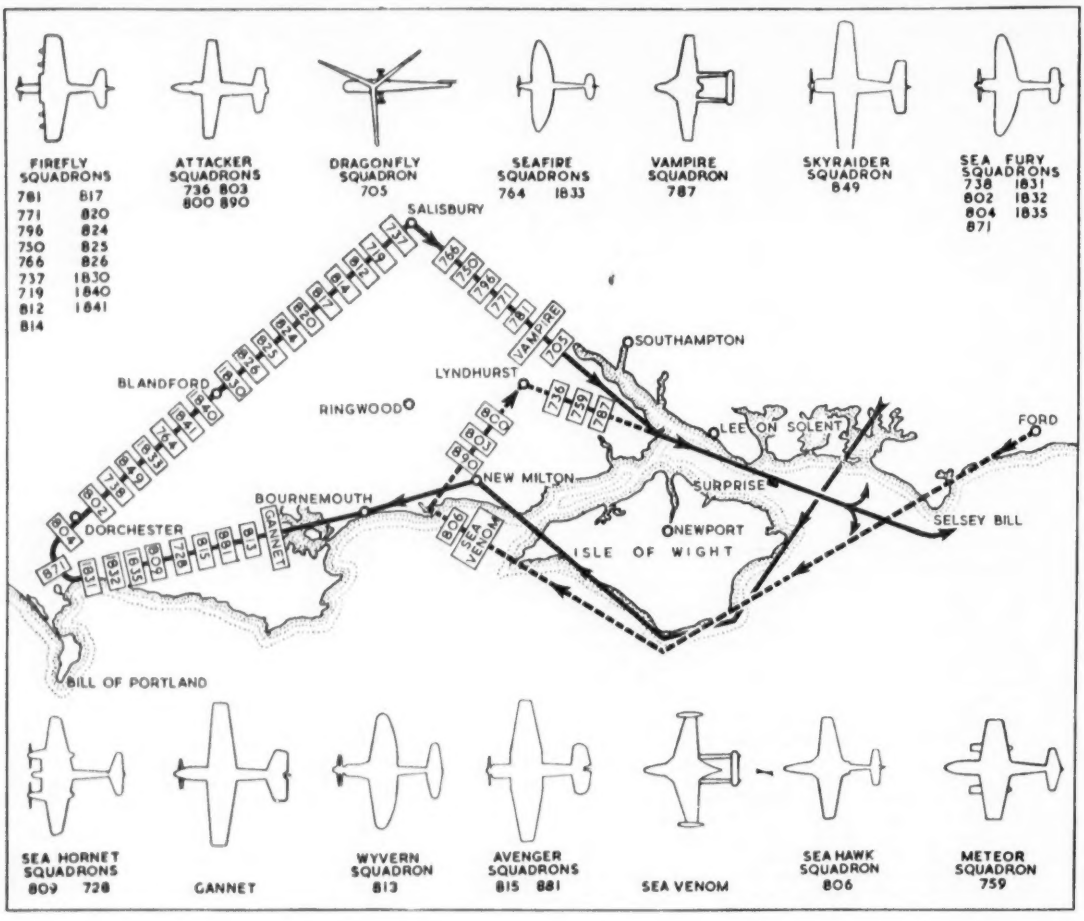
781 (Firefly 1 and 3); 771 Fleet Requirements Unit (Firefly, various marks); 796 (Firefly A.S.3); 750 (Firefly A.S.7); 766 (Firefly 1); 737 (Firefly A.S.6); 719 (Firefly A.S.7); 812, 814, 817, 820 (Firefly A.S.6); 824 (Firefly A.S.7); 825, 826 (Firefly A.S.6); 1830, 1840, 1841 R.N.V.R. (Firefly A.S.6); 764 and 1833 R.N.V.R. (Seafire F.R.17 or 47); 849 (Skyraider); 738, 802, 804, 871 (Sea Fury F.B.11); 1831, 1832, 1835 R.N.V.R. (Sea Fury F.B.11); 809, 728 (Sea Hornet N.F.21); 815 (Avenger A.S.3); 881 R.C.N. (Avenger); 813 (Wyvern S.4); Fairey Gannet A.S 1; 787 (Sea Vampire); 759 (Meteor T.7); 736, 800, 803, 890 (Attacker F.B.2); 806 (Sea Hawk F.B.1); Sea Venom.

Moored in the Spithead, nine aircraft carriers will be taking part in the Review. (All vessels being reviewed will be dressed overall with flags and manned, with the ship's company fallen in on the main deck facing outboard.)

H.M.S. *Eagle* (Flagship of Vice-Admiral J. Hughes-Hallett, C.B., D.S.O., Flag Officer, Heavy Squadron, Home Fleet); H.M.S. *Illustrious*; H.M.S. *Implacable* (Flagship of Vice-Admiral J. F. Stevens, C.B., C.B.E., Flag Officer, Training Squadron); H.M.S. *Indefatigable*; H.M.S. *Indomitable*; H.M.C.S. *Magnificent* (Broad Pendant of Commodore H. S. Rayner, D.S.C., C.D., R.C.N.); H.M.S. *Perseus*; H.M.A.S. *Sydney*; and H.M.S. *Theseus*.

H.M.S. *Eagle* is one of the most important ships, if not the most important, in the Royal Navy at present. Her full-load displacement of 45,000 tons makes her easily Britain's biggest aircraft carrier, and it has been officially reported that she will be capable of housing over 100 aircraft of the calibre of the Wyvern or Sea Hawk. Like all other Fleet carriers of the Royal Navy, her main armament consists of 16 4.5in guns in twin turrets, while her secondary armament comprises at least 57 40 mm Bofors guns.

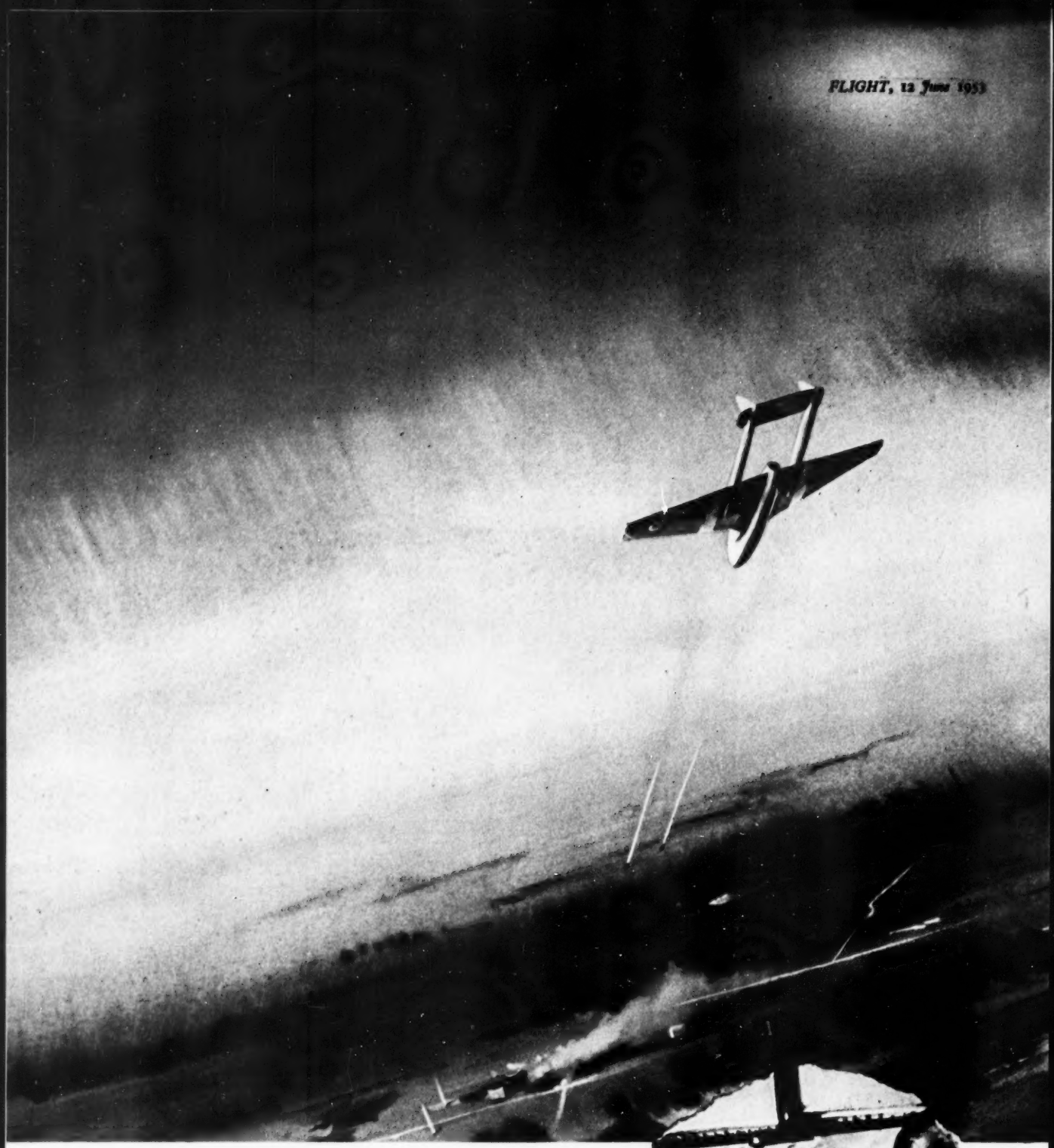
Compared with earlier Fleet carriers, *Eagle* has a rather higher freeboard and a unique flat stern. The "island" is longer, the funnel taller and more prominent, and a lattice mainmast is fitted. She is at present serving with the Home Fleet and in the Royal



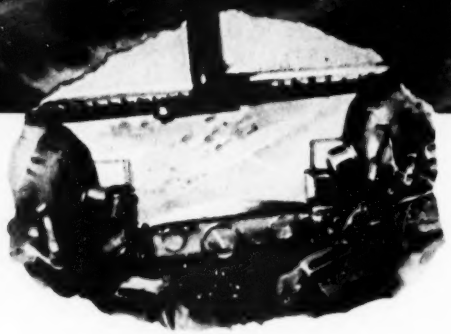
THE Royal Navy, which has to maintain sea communications, regards counter-measures to the submarine threat as of first importance. Much of the new anti-submarine equipment is specialised, and demands unique capabilities and characteristics from the aircraft employed. To cover this feature of defence the Fairey Gannet is in super-priority production, and has also been ordered for the Royal Australian Navy.

FAIREY AVIATION

THE FAIREY AVIATION COMPANY LIMITED · HAYES · MIDDLESEX



Full fighter performance in the training role. A docile, sensitive aeroplane with complete duplication of flying and weapon controls and with side-by-side seating; the finest configuration for pilot and pupil.



DE HAVILLAND VAMPIRE TRAINER

de Havilland Goblin turbine

The Royal Naval Review and Fly-Past . . .

Leading the fixed-wing aircraft will be a Sea Vampire (right) flown by the Flag Officer, Flying Training. The Westland Dragonflies (below) equip No. 705 Squadron based at Gosport. The Firefly (below, right) of 1840 Squadron R.N.V.R. is typical of the hundreds in the Service.

"Flight" photograph

"Flight" photograph

Review will fly the flag of Vice-Admiral J. Hughes-Hallett, C.B., D.S.O., Flag Officer, Heavy Squadron, Home Fleet.

H.M.S. *Illustrious*, of some 23,000 tons, was one of the first of our Fleet carriers, having been completed early in the war. Recently reconstructed with a bow and stern resembling those of Light Fleet carriers, she is at present the Navy's training and trials carrier, and it was on *Illustrious* that so many of our present Naval aircraft completed their deck trials.

H.M.S. *Implacable* and *Indefatigable*, each of about 26,000 tons, are very similar Fleet carriers, both serving with the Home Fleet Training Squadron. *Indefatigable* is distinguishable by the squarish super-structure which has been built on the after-end of the flight-deck. *Implacable* will carry the flag of Vice-Admiral J. F. Stevens, C.B., C.B.E., Flag Officer, Training Squadron.

H.M.S. *Indomitable*, now serving with the Home Fleet, was completely reconstructed shortly after the end of the war, and her displacement has probably increased above her original 23,500 tons.

H.M.C.S. *Magnificent* is one of the 14,000-ton *Hercules* class of Light Fleet carriers, and she is now on loan to the Royal Canadian Navy pending the completion of the larger *Bonaventure*. In the Review, *Magnificent* will wear the broad pendant of Cdre. H. S. Rayner, D.S.C., C.D., R.C.N.

H.M.S. *Perseus* is a standard Light Fleet carrier, and she is at present engaged on ferrying and trooping work. *Perseus* was the ship upon which the steam catapult was first fitted, and in this condition she demonstrated this new device to the U.S. Navy last year.

H.M.A.S. *Sydney* is another 14,000-ton ship of the *Hercules* class, and she is on loan to the Royal Australian Navy. Her normal complement includes Sea Fury fighters, Firefly strike aircraft and Sycamore air sea rescue helicopters. *Sydney* has done excellent work in Korea.

AIRCRAFT IN THE FLY-PAST

WESTLAND DRAGONFLY. Although of Sikorsky basic design, this familiar helicopter has been much modified by the Westland company, and in particular, has been re-engined with the compact and powerful Leonides. Compared with the American S-51, the Dragonfly is heavier and usually carries a number of additional items of equipment. The Royal Navy is the biggest Dragonfly operator, and these graceful silver machines will soon be found on every carrier and Naval airfield. They will be used for training; for all manner of liaison purposes between ships and shore; and as sea/air rescue machines replacing Sea Otters on airfields and attendant destroyers in carrier task-forces. They carry hydraulic winches, all-weather blind-flying and radio equipment and many have metal rotor-blades which improve performance and control. Rotary-wing training and research is carried out by No. 705 helicopter squadron at Gosport, whose aircraft will precede the fixed-wing fly-past.

DE HAVILLAND SEA VAMPIRE. Although the Vampire never equipped a first-line fighter squadron of the Royal Navy, many are used as general-purpose trainers in addition to their popular

More Fireflies: the formation (below, left) is of series A.S.6 machines which equip many squadrons. The A.S.7 (right) shows off its new wing plan, rear cockpit and cowling. The wing has a kinked leading edge. Several Squadrons are converting to this type; those in the fly-past will be 719, 750 and 824.

"Flight" photographs

H.M.S. "Eagle" "Flight" photograph

H.M.S. "Indomitable"

H.M.C.S. "Magnificent"

The Royal Naval Review and Fly-Past . . .

work as "hacks" for Fleet Air Arm officers of the rank of captain and above. One of the latter type will, in fact, lead the fly-past. The squadron of Vampires, No. 756, is equipped with operational fighters, in appearance much like the R.A.F.'s Vampire 5s, from which they differ superficially in having an arrester-hook faired in above the jet outlet and larger-area flaps which project behind the trailing-edge of the wing.

FAIREY FIREFLY. The backbone of the Fleet Air Arm's striking power is at present vested in the Fireflies 5 and 6, which between them undertake ground and carrier-based anti-shipping and anti-submarine work as well as air fighting and strike against shore targets. Although the original Firefly design dates from the earliest days of the war, many hundreds of these popular and reliable aircraft are still in service and they are still considered efficient in their multitude of duties. Particularly in Korea, the Firefly has done yeoman work both with the Royal Navy and Royal Australian Navy.

The latest Firefly is the Mk 7, which is now equipping training squadrons for anti-submarine observers. In this type of Firefly a cockpit arrangement rather similar to that of the Gannet (but for two seats only) has been incorporated, and the Firefly 7 is now being used as an interim land-based machine pending the Gannet's arrival. The "7" has an entirely new wing and tail, and the coolant radiators have been moved from the centre section to a new position in the front of the engine cowling.

SUPERMARINE SEAFIRE. Although this renowned fighter no longer equips first-line squadrons of the Fleet Air Arm, quite large numbers are still in service with second-line and V.R. squadrons. The majority are Mk 17s, with a single-stage Griffon driving a four-blade airscrew, but quite a number of Seafires are of the F.R.47 type with a big two-stage engine driving a six-blade contraprop; they also have four cannon and a new wing and tail. It is general policy to replace the Seafires with other types as they become available, and it is unlikely that the Seafires will remain as standard squadron equipment for more than about another year.

DOUGLAS SKYRAIDER. From a distance, these aircraft look much like any other single-engined Naval aircraft; but the Skyraider conceals a multitude of surprises beneath its bulky black hull. Underneath, it carries a radome whose almost indecent size is indicative of the unique power of the electronic equipment carried. To work the set, two crewmen sit in the fuselage surrounded by "black boxes," and they can see ships and aircraft far beyond normal visual range in any weather. Each operational carrier will eventually house a flight of four Skyraiders, which will provide early warning barrier radar and fighter interception control facilities.

The Skyraiders are supplied from America under the mutual-aid programme. Their weight is carried by a straight-tapered wing of no less than 400 sq ft area, which is fitted with fixed slats. Also noteworthy are the tall fin and rudder and small auxiliary fins on the tailplane. Training and administration of the Skyraiders is carried out by No. 849 Squadron, which will provide eight aircraft for the fly-past.

HAWKER SEA FURY. Last of all British reciprocating-engine fighters, the Sea Fury combines a number of outstanding qualities including good all-round performance, manœuvrability, the ability to carry a heavy load, and sheer ruggedness which has brought it back from many an arduous mission in safety. In Korea the work of the Sea Fury has included successful combats with Mig 15s as well as dive-bombing, rocket-strafing and general offensive patrol. Sea Furies are also used by Australia, Canada and other countries.

Although little of the Hurricane can be discerned in the Sea Fury, there is plenty of Tempest influence, noteworthy features being the neat Centaurus radial, the elliptical wing and a general air of good breeding. Quite noticeable is the growl of the big Bristol sleeve-valve engine—softer, and of a much lower note, than that of the Rolls-Royce engined aircraft.

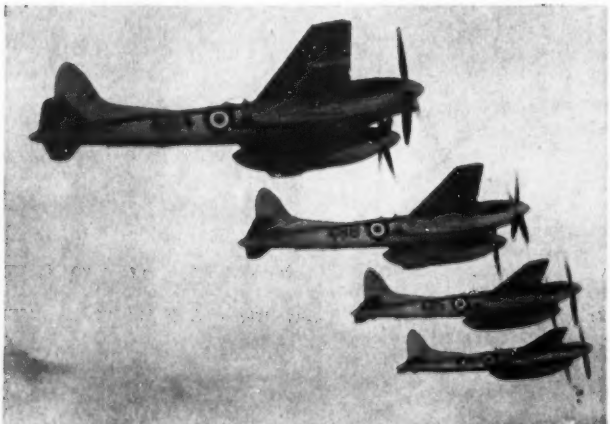
DE HAVILLAND SEA HORNET. At one time probably the fastest and longest-ranged fighter in the world, the Sea Hornet has given fine service with a number of Fleet Air Arm squadrons of which No. 809 is the last. The aircraft of this unit are, like most of the

Seafire 17s of a V.R. squadron. "Flight" photograph

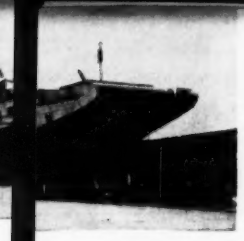
A Skyraider of No. 849 Squadron. "Flight" photograph

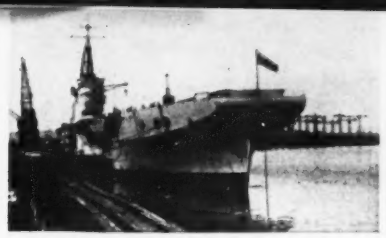
Fireflies, followed by fo

Sea Hornets of No. 809 Squadron.



An Avenger used for transport duties.





H.M.S. "Perseus"

H.M.A.S. "Sydney"

Navy's Sea Hornets, of the N.F.21 series which have an A.I. radar set installed in the nose and worked by a navigator seated facing rearwards in a little cockpit above the trailing-edge of the wing. Apart from the Meteor, the Sea Hornet will be the only twin-engined aircraft in the fly-past. This may be the last time the type is seen in public, for with the availability of the Sea Venom the Hornet's days are numbered.

GRUMMAN AVENGER. Ever since 1943 the Fleet Air Arm has used many Avengers, first for torpedo-bombing and reconnaissance, and since the war for miscellaneous transport duties. These worthy aircraft are now being joined by much newer and very different Avengers allocated under Marshall Aid funds. Equipped with strike radar and a heavy offensive load, these TBM-3Es will act as anti-submarine attack aircraft in conjunction with search machines such as the Skyraider. Other Avengers of the TBM-3W type carry a large "Guppy" radome and can look for their own submarines. Two Canadian Avenger squadrons are at present very active, one of which, No. 881, will be seen in the fly-past.

The Avenger is easily distinguished by its broad, angular wing, which tapers sharply to small tips. The wing is set midway on the fat, blunt fuselage, which can have a profusion of glasshouses and radomes according to the work upon which the aircraft is engaged. The Canadian machines carry strike radar in a capsule under the starboard wing, and the search Avengers have auxiliary fins on the tailplane. No. 815 Squadron has recently converted to Avengers supplied under Marshall Aid. and they are now training anti-submarine observers in conjunction with the Anti-Submarine School at Londonderry.

WESTLAND WYVERN S.4. Capable of attacking any kind of ship or shore target with guns, bombs or rockets, the Wyvern combines great load-carrying ability with easy manœuvrability and the speed of a Vampire. In spite of its complexity and size, the Wyvern is proving quite manageable by its pilot, who sits in solitary state in his ejection seat on top of the hump-backed fuselage from which he has an excellent view in all directions. The whine of the great Python turboprop and eight-blade Rotol airscrew is distinctive.

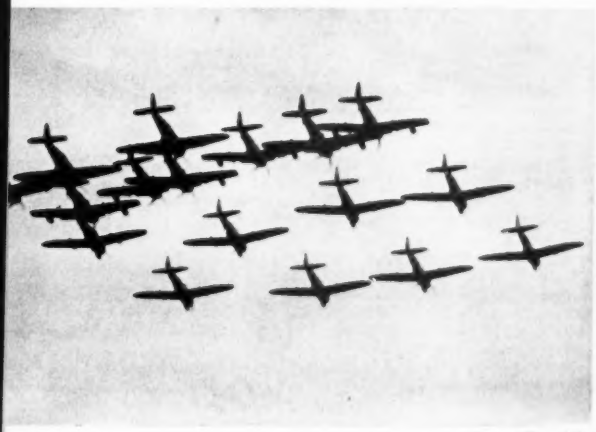
From the visual point of view, noteworthy features are the humped, streamlined fuselage, elliptical wing with slight crank, and the unique tail with its huge single fin of distinctive shape and auxiliary fins mounted on the dihedral tailplane. No. 813 Squadron have just got their Wyverns, and other units are in the process of conversion.

"Flight" photograph

H.M.S. "Theseus"

FAIREY GANNET A.S.1. Strictly speaking, the Gannet should not be in this fly-past at all, for it is not yet in service with the Royal Navy; but, as the anti-submarine rôle is accepted as the Fleet Air Arm's most vital task, shortly to be undertaken largely by the Gannet, it can readily be seen that here is an aircraft of the greatest importance. Accordingly, the makers have provided three Gannets which will give the spectators a taste of striking power soon to come.

Adopted as the standard carrier-based anti-submarine aircraft, the Gannet combines the functions of two aeroplanes in one modest-sized airframe. Not only does it carry comprehensive search and attack radar, and a considerable fuel load to provide the necessary low-altitude endurance, but the Gannet also finds room for a very capacious weapons-bay reminiscent of that of the Lancaster. Power unit is the Armstrong Siddeley Double Mamba turboprop, either half of which can be switched off at will to extend



Sea Furies.

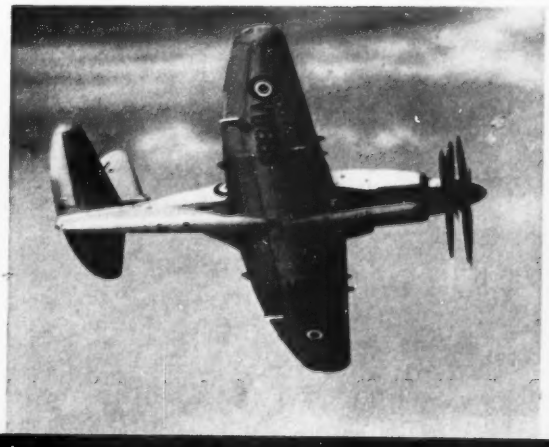
Crown Copyright

Sea Furies of the 20th C.A.G. (Australian)

"Flight" photograph

A Wyvern S.4 of No. 813 Squadron.

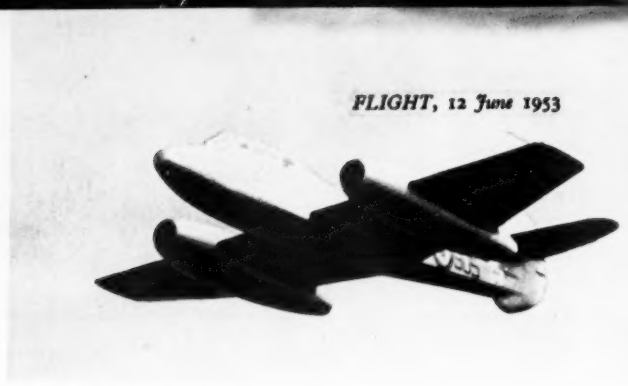
"Flight" photograph



A production-prototype Gannet A.S.1.

"Flight" photograph

A line-up of Sea Vampires and Meteor T.7s.



A Meteor T.7 of 759 Squadron.

The Royal Naval Review and Fly-Past . . .

range and endurance. In the fly-past, the Gannets will probably use both halves of their engines, and the aircraft will be immediately distinguishable by virtue of their smooth humming engine note. Other distinctive features are the wide-span cranked wings, the three separate cockpit canopies along the top of the portly fuselage, and the large auxiliary fins on the tailplane. Although the Gannet may appear rather ungainly, it is very manœuvrable and is certain to be greatly liked both in the Royal Navy and Royal Australian Navy.

GLOSTER METEOR. Although there was a hooked and partially navalized Meteor of early vintage many years ago, all the Fleet Air Arm's Meteors are now land-based. The great majority are T Mk.7s and they are used for advanced training, jet conversion, renewal of instrument cards, and for such work as reconnaissance, fast liaison, photography and target-towing. The majority of these Meteors carry yellow "training" bands, and they equip second-line squadrons, of which No. 759 in the fly-past is typical. Other users are the Fleet Requirements Unit (771 Squadron), represented in the fly-past by Fireflies.

SUPERMARINE ATTACKER F.B.2. This, the standard fighter/bomber of the Royal Navy at present, is unusual among modern fighters in that it employs a tailwheel-type undercarriage. The basic Attacker design was the progenitor of a great line of jet fighters, one branch of which has culminated in the Supermarine Swift of the Royal Air Force; the other branch will shortly produce a very large and fast carrier-based fighter developed by way of the Supermarine 508.

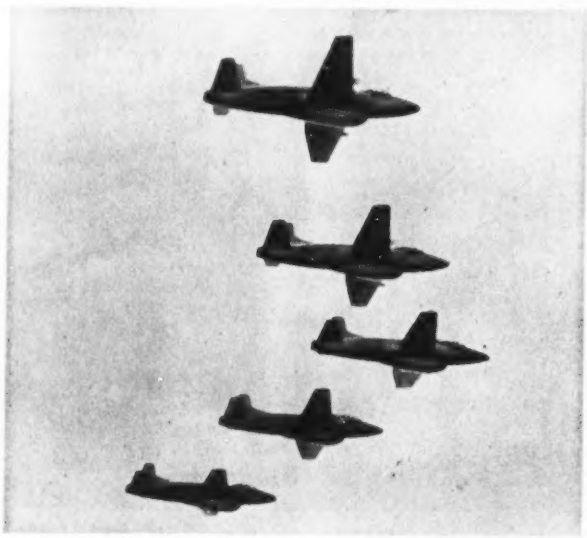
The Attacker is now well past all its teething troubles and is proving itself an efficient and much-liked fighter. Its armament of four Hispano cannon is carried in the unswept laminar-flow wing, only the tips of which fold. A heavy under-wing offensive load can be carried, and a common and prominent excrescence is a huge external fuel tank which fits flush beneath the fuselage. Apart from this tank, the Attacker has fine lines and more closely resembles a winged projectile than do most other fighters. The wings are straight-tapered and have quite small area, and the stumpy tail is mounted well forward of the jet efflux. The Royal Navy's premier squadron, No. 800, was the first to equip with the Attacker and will be seen in the fly-past together with Nos. 803, 890 and 736 (second line) squadrons.

HAWKER SEA HAWK. Adopted as the standard Naval fighter/bomber to replace the Attacker, the Sea Hawk is one of the cleanest and most graceful of all modern fighters. It is, in fact, so devoid of excrescences that the spectator's first impression might well be that something was missing. Although it is a single-engined machine (Rolls-Royce Nene) there are two wing-root intakes and twin jet-pipes, the latter arrangement being adopted to permit the installation of a useful fuel tank in the rear fuselage. The fuselage itself is finely streamlined and appears to merge into the mid-mounted straight-tapered wing, the whole lot being rounded off by a typical Hawker tail of the pre-sweep era. Four 20 mm cannon are mounted under the floor and there is provision for a considerable weight of under-wing stores.

As this fly-past shows, No. 806 Squadron are already very proficient on their new aircraft, and many other squadrons are due to form up this year to match the considerable Sea Hawk production from the Hawker and Armstrong Whitworth factories. A batch of 107 Sea Hawks is due to be built for the Royal Navy under an American off-shore purchase.

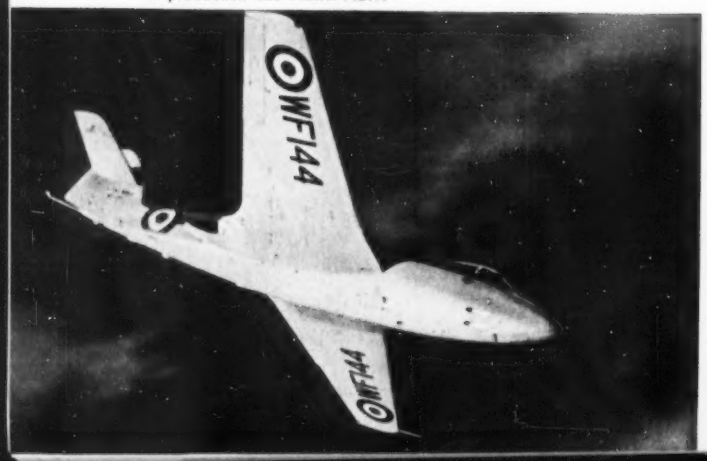
DE HAVILLAND SEA VENOM. Soon to be the standard carrier-based all-weather fighter, the Sea Venom shows an increase of nearly 200 m.p.h. over the Sea Hornet which it replaces. The pilot and navigator sit side-by-side in the compact central nacelle, in the rear end of which is the large Ghost turbojet. In the nose is the airborne interception radar, and four Hispano cannon are mounted beneath the floor. The Venom shows obvious signs of having been developed from the Vampire, from which it differs in having a very thin wing with leading-edge sweep and with fuel tanks on the tips. The arrester hook is also housed in a prominent fairing which nearly reaches to the tailplane.

Sea Venoms are only now leaving production lines, for land-based aircraft have been filling the factories until now. Production Sea Venoms are likely to embody all the latest improvements, such as clear-vision canopy and extended dorsal fins. Only one Sea Venom will appear in the fly-past, but units are due to form this year.

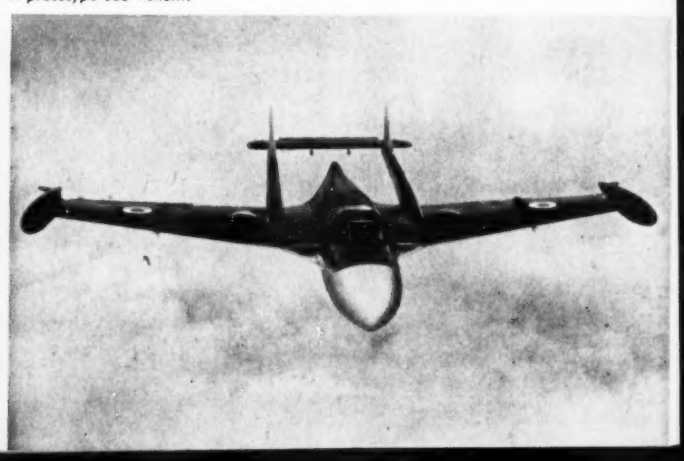


Attacker F.B.2s of No. 800 Squadron.

A production Sea Hawk F.B.1.



A prototype Sea Venom.



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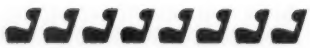

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AERONAUTICAL ACOUSTICS

The Problems of Noise Discussed at R.Ae.S. and Physical Society Joint Symposium

AS we briefly recorded last week, noise problems of present-day aircraft were the subject of an all-day joint symposium held recently in London by the Royal Aeronautical Society and the Acoustics Group of the Physical Society. The general title of the day's discussions was *Aeronautical Acoustics—in particular Jet Noise.*

Jet-engine Noise—1: Under the chairmanship of Mr. N. Fleming, the first two of the morning's papers were concerned with engine noise. The opening speaker was Professor E. J. Richards, M.A., B.Sc., F.R.Ae.S. (Southampton University), who began his paper, *Jet-Engine Noise*, by reviewing work at present being carried out. On the jet side, he pointed out, this consisted of much theoretical and model work by Manchester and Southampton Universities and the College of Aeronautics, while other work had been done also by the N.P.L., Rolls-Royce, Faireys and Saunders-Roe.

Aerodynamic noise from a jet, the speaker continued, arose from three general sources: (1) Subsonically, as a field of acoustic quadrupoles, giving rise to noise increasing roughly as V^8, the high-frequency noise coming from the high velocity shear and turbulence at the edge of the jet close to the nozzle, and the low-frequency noise coming from the larger burbles downstream. (2) A further and more potent source of noise occurring when a jet was choked due to the standing shock-waves set up along the jet. Any eddy moving downstream with the jet would give a sound-wave as it passed through the shock-waves, the sound in turn travelling upstream. When the sound-wave reached the edge of the jet, the varying pressure in the sound-wave caused the over-expansion to fluctuate, and the ensuing fluctuating flow passed downstream. A resonance mechanism was thus established, and the growth of noise with increasing pressure ratio above choking took the form of a series of well-defined notes interspersed with regions where no single noise was apparent. (3) A further source of noise in a jet was that caused by noisy combustion in and aft of the flame tubes.

Model experiments indicated that the maximum intensity of noise from an unchoked jet was in a downstream direction at an angle of between 30 and 40 deg to the jet axis, this angle being less for low frequencies than for high frequencies. These observations agreed with Lighthill's theory. Most modern jet engines were slightly choked at take-off, and heavily over-choked in cruising flight at altitude. Under these latter conditions, the predominant noise arose from shock-wave/eddy interference and resonance, and was greatest at an angle somewhat more than 90 deg to the jet axis.

The high order in velocity to which the noise corresponded (V to the eighth power subsonically, and far higher when the jet was well choked) gave the greatest clue to future noise suppression. As in flight it was the relative velocity to this power that was the essential parameter, a very good return should be obtained from any reductions in jet velocity, even when the mass-flow was increased to give a constant thrust.

Turning to noise-suppression devices, the speaker mentioned the success obtained in model experiments. The College of Aeronautics had invented a jet-pipe with fingers inserted slightly into the jet stream around its periphery, which appeared to be most effective while causing little or no loss in thrust. Southampton had put forward a corrugated jet-pipe, possibly easier to maintain, which worked very well at over-choked jet speeds, giving noise reductions at some 15 to 20 decibels.

In the over-choked case, it was thought that the primary object of noise reduction was the elimination of the resonance mechanism, which so greatly aggravated the noise, by preventing the formation of any discrete eddies. Subsonically, it was thought that noise reduction would be obtained by a reduction of the velocity shear at the jet exhaust. Since any device essentially gave rise to added turbulence, Professor Richards concluded, the noise reduction obtained depended on a fine balance between that given by shear velocity reduction and that lost by the added turbulence.

Jet-engine Noise—2: The second paper on engine noise was given by Mr. F. B. Greatrex, B.A., A.M.I.E.E., A.F.R.Ae.S. (of Rolls-Royce), who began by describing the noise field around the jet from a jet engine. Velocity and temperature were seen from illustrations of typical traverses to remain uniform to within ½in of the nozzle walls. Details of noise measurements made around a specially-mounted Derwent engine were then given, and typical results shown. The general pattern of noise did appear to be independent of the type of engine, which was to be expected if the noise pattern were entirely due to the interaction of the high-velocity jet with the surrounding air.

The speaker continued by comparing model test results with theory; the variation with frequency of the peak noise angle generally agreed with the variation obtained on model tests, the actual figures being 14 deg from the jet centre line in the 37·5 to 75 c.p.s. band varying round to 70 deg in the 2,400 to 4,800 c.p.s. band. The apparent sources of the noise also seemed to be farther downstream at the lower frequencies, as in the model tests.

The loudest noise appeared to occur at approximately 30 deg to the jet axis. A point on this 30-deg line at 20 yd from the jet nozzle had therefore been chosen for a more detailed investigation, and the results were extremely interesting when compared with the main points of the Lighthill theory: (i) the theory implied that the noise produced by a jet was independent of the jet temperature, and model tests had supported this. In the full-scale tests on the Derwent and Avon engines, jet temperature variations had produced no deviation from a straight-forward power law relationship between noise and velocity. (ii) The results concerning this power law relationship were particularly striking; the index was exactly eight for the Derwent results, agreeing precisely with the theory. Very good agreement was found in the case of the Avon also. Any shock-wave phenomena that might have occurred did not seem to have had any appreciable effect on the noise. (iii) The theory predicted that the noise should vary as the square of the jet nozzle diameter. Such a correction did not account for the difference between the engines however—there remained a difference of some seven decibels—but this could possibly be explained by the different test conditions and the different noise analyzers used.

Clearly, the speaker continued, it was high jet velocity that was the real culprit in producing noise. It was therefore unfortunate that one of the most useful methods of getting a large thrust out of a small engine, by the use of re-heat or afterburning in the jet pipe, depended entirely on increasing this velocity. Mr. Greatrex went on to illustrate the principles involved in the re-heat process. The amount of fuel needed to produce the given thrust (with pressure ratio and hence Mach number in the jet constant) increased rapidly, but the hotter engines were smaller, requiring a reduced airflow, and this was the great advantage of this type of engine. The maximum noise increase to be expected, due to the increase in velocity alone, was about 18½db.

In practice, re-heat was applied to an existing engine, increasing the nozzle area so that the airflow was maintained constant. With the further noise contributed by the increased nozzle area and thrust, the maximum possible noise increase due to applying re-heat to an existing engine would be about 21 decibels—giving an overall intensity at 20 yd and 30 deg from an Avon of 160 decibels. Fortunately (as far as noise and vibration were concerned), the very large thrust increases theoretically possible with re-heat were still not realized in practice. Practical evidence concerning re-heat, taken from an R.A.E. report on noise tests on a Derwent engine, supplied further confirmation of the Lighthill theory. It was clear that the use of re-heat presented a formidable problem in its associated noise, a problem which must be mastered in order that its performance advantages could be effectively used.

Concerning noise reduction methods, there was firstly the possibility of designing an engine from the start to use a lower jet velocity. Such a low-temperature engine, however, would inevitably be larger, but the fuel consumption would be reduced. The large civil jet airliner was an extremely suitable application for an engine of this type, such as the Conway, and it was hoped that measurements shortly to be made would confirm the expected noise reduction.

Secondly, there were a number of devices which had been found to give substantial noise reductions when tested on model jets at Cranfield, Manchester and Southampton. The most promising of these, at any

Effect on Noise at High r.p.m.

Type of device	Low Frequencies		High Frequencies	
	15-45 deg from jet axis (db)	45-120 deg from jet axis (db)	15-45 deg from jet axis (db)	45-120 deg from jet axis (db)
1	−8	+2-3	−3	+6
2	−6	slight increase	−2	+4
3	−5	unchanged	unchanged	+4
4	−3	−2	−4	−2
5	unchanged	unchanged	+2	unchanged

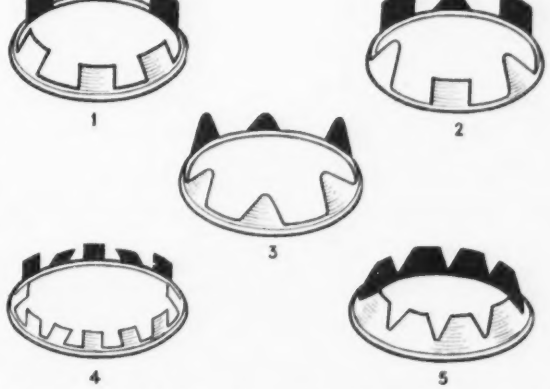


Fig. 1. The results of full-scale tests on a Derwent engine, using various noise-reduction devices: (1) Equi-spaced square teeth, three parallel to axis, three inclined inwards at 30 deg; (2) three square teeth parallel to axis, three triangular teeth inclined inwards; (3) six triangular teeth arranged as in (1); (4) square teeth, six parallel to axis, six inclined inwards; (5) eight vee-notches cut in standard convergent nozzle. Dimensions of all teeth are 1/12 circumference (sides of square, base and height of triangle) except those of (4) which are 1/24 circumference.

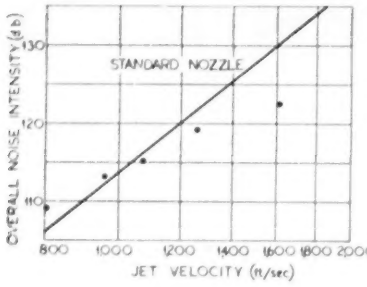


Fig. 2. The summed noise intensity of a Derwent engine at the 50ft, 30 deg point, plotted against jet velocity. The line is that for the standard nozzle without teeth, while the points refer to the six-toothed nozzle (the first device in Fig. 1).

AERONAUTICAL ACOUSTICS . . .

rate for the subsonic jet speeds, consisted of teeth attached to the jet nozzle, either parallel to the jet axis or bent inwards. Details of the various arrangements of teeth and their relative effectiveness were then given by the speaker. (See Fig. 1).

The noise reduction effected by the best arrangement of six square teeth was obtained with negligible effect on engine performance, the only measurable change being a very slight increase in jet-pipe temperature. A graph of noise intensity against jet velocity showed that the noise reduction appeared to be effective only at the higher jet velocities. The speaker went on to give estimates of the improvements in specific ground and air cases and to give reasons for the suggestion that the R.A.E. recommendation for the maximum cruising noise-level in civil aircraft should be revised.

From the model test results, the future for noise reduction was not a pessimistic one, but it was possible that these noise reduction devices might have other troubles associated with them, such as a more rapid spread of the jet, which had not yet been properly explored.

The general discussion on engine noise which followed the two main papers was opened by Mr. Radcliffe, of the National Gas Turbine Establishment, who referred to his department's experimental work on noise measurement from engines fitted with re-heat. Mr. A. Stepan, of Fairey Aviation, referred to tests on pressure jets for helicopters, and Professor Baxter, of the College of Aeronautics, commented on the noise due to combustion with particular reference to the afterburning. Mr. Lilley, who was to read the third paper of the meeting, spoke of the correlation between experiment and the Lighthill theory, which was not unreservedly significant.

Mr. Sawyer, of the Bristol Aeroplane Company, who was concerned with the practical aspects of noise reduction, mentioned that the intake effects were certainly important, giving as an example his company's experience which showed that, in one case, three-quarters of the noise of a ramjet had come from the intake side. Mr. Saunders, a student, inquired whether cuffs, internal screens, or a change in jet pipe section might not improve matters. Mr. Brian Eales, of Percivals, asked for an analysis of the noise factors involved with re-heat, and other questions concerned the distinct types of noise heard.

Replying to the discussion, Professor Richards expressed the opinion that re-heat "should be put into perspective," for it was not really likely to be used in civil airliners. The engine manufacturers, he continued, should examine the different requirements for military and civil engines. He questioned the wisdom of starting with a high jet velocity, and then trying to improve matters; reduced jet velocities should be aimed at from the beginning, and this would also improve the specific fuel consumption.

With increasing altitude, the pressure ratios experienced were as high as 3½, i.e., the jets were highly choked, and so considerable noise was inevitable. It was necessary to reduce both the shear velocity and turbulence; at present, the former was, in fact, being successfully reduced, but this sometimes caused the turbulence to increase. Concerning the low-frequency noises experienced, these appeared to have peak values some distance downstream, and it was thought that large-scale burbling downstream was the cause of this rumbling noise, although a further source might be inside the engine.

Mr. Greatrex disagreed that turbulence was an important source of noise, even when re-heat was used. In general, combustion was completed inside the pipe, and very little turbulence remained in the gas by the time it arrived at the jet pipe. He agreed that a reduction in velocity was necessary, though difficult to achieve in practice. He thought that a reduction of eight to ten decibels would be useful for civil aircraft.

AIRCRAFT NOISE

Aircraft noise was the second main topic, under the chairmanship of Mr. W. Makinson, and the first paper in this section, *Aerodynamic Noise*, was presented by Mr. G. M. Lilley, M.Sc., D.I.C., A.F.R.Ae.S., of the College of Aeronautics.

Aerodynamic Noise.—After defining the scope of aerodynamic noise, Mr. Lilley spoke of earlier work in acoustics. The importance of aerodynamic noise had been recognized in the explanation of such phenomena as bird calls, Aeolian harps, and edge tones, in which cases it had been shown that the sound was generated by instabilities in flow caused by vortex formations. Although these investigations had led to a qualitative understanding of the frequency spectra, a dynamical theory was lacking. In addition, the importance of the conversion of a small part of the mechanical energy in the flow to acoustic energy had not been studied. It was not surprising with the rapid progress in the understanding of jet noise that some of the new ideas should be applied to these classical problems.

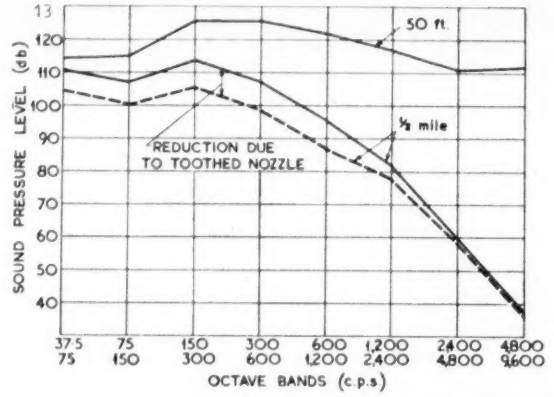


Fig. 3. Derwent ground-running noise, showing calculated attentuation due to distance, and noise-reduction due to toothed nozzle, measured along a line at 30 deg to the jet axis.

Although it was known that aerodynamic noise (generated from the boundary layers and wakes) was responsible for much of the total noise heard in aircraft cabins, and was comparable to the noise from the propeller and engine exhaust, it was only in the latter cases that intensive investigation had been made. Propeller noise was generated by periodic excitations in the flow due to the rotating blades. These were the result of (a) the displacement of air caused by the moving blades (torque noise) represented mathematically by a distribution of acoustic sources, and (b) the forces exerted on the air by the moving blades (thrust noise) represented mathematically by a distribution of acoustic dipoles. In addition there was the noise due to the vortex motion in the wake or slipstream, and at high speeds the shock-waves which were present increased the high-frequency content of the noise.

In view of the success of the theory in reproducing measured frequency spectra, the acoustic power, and the directivity of the noise from the rotating system, similar theories could be expected to explain the noise due to the propeller in forward motion, as well as to explain the direct noise due to bodies (i.e., aircraft) in motion through the air.

Mr. Lilley went on to discuss and explain Lighthill's theory of aerodynamic noise, the results of which indicated that aerodynamic noise was generated when rates of momentum flux across fixed surfaces fluctuated. It was seen also, he continued, that turbulence at low Mach numbers was a relatively inefficient producer of sound. At higher Mach numbers, therefore, increased acoustic energy was emitted in directions making an acute angle with the direction of motion, and a decreased quantity in those directions making an obtuse angle. Finally, the theory supported the conclusion that small and large eddies in the turbulent field gave rise to high- and low-frequency noise respectively.

Experimental studies on boundary-layer noise had been mainly confined to the flow of air in ducts. Measurements obtained with wall microphones were unsuitable, since in general they would respond to the fluctuations in pressure in the boundary layer which were balanced out by accelerations in the flow, and were therefore not radiated as noise. However, from those measurements which were available, certain important conclusions could be deduced concerning acoustic efficiency, frequency and intensity.

The results of allied experiments suggested that, in general, the intensity of aerodynamic noise increased with increase of aerodynamic drag. This suggested that aerodynamically clean aircraft would have lower noise levels associated with boundary layers and wakes, than aircraft having extensive areas of separated flow.

From Lighthill's theory and the experiments on cold bodies at Manchester and Southampton Universities and the College of Aeronautics, some insight into the sound field from a jet had been established. The noise arose from turbulence in the shear layer downstream of the jet exit. Just downstream of the exit the scale of turbulence was small, and consequently the emitted noise was of high-frequency. Farther downstream, as the scale of turbulence increased, so the frequency of the emitted noise was lowered. The directivity patterns showed marked changes in each band of frequencies. A comparison with Lighthill's theory suggested that the high-frequency sound radiators were moving at a relatively low velocity near the jet boundary, close to the jet exit, while those of low-frequency were moving at approximately the mean jet speed, close to the jet axis farther downstream.

Above choking, the jet flow was modified by the presence of stationary shock-waves. The high-frequency content of the noise increased, and the noise radiated upstream of the jet could, in certain cases, be greater than that radiated downstream. Below choking, the intensity was proportional to the sixth to the eighth power of the velocity, but above choking the power might be as high as 17.

After giving expressions for the frequency at maximum intensity, acoustic efficiency and intensity, Mr. Lilley concluded, "The theoretical work of Lighthill and the experiments on jet noise have gone a long way towards the understanding of aerodynamic noise. There still remain intensive investigations to be made on the problems of boundary layer and wake noise, as well as turbulence and noise correlations in all fields of aerodynamic noise. Finally, the major aim of the work must not be lost sight of; that is, the suppression of aerodynamic noise."

Noise Associated with Supersonic Flight—a subject with which regular readers of *Flight* are familiar—was next dealt with, by Mr. C. H. E. Warren, M.A., A.F.I.A.S., A.F.R.Ae.S., of the Aerodynamics

Department of the Royal Aircraft Establishment. Mr. Warren began by reviewing the sources of noise at subsonic speeds, comparing them with those at sonic speed and above, and stating among his assumptions that the air would be considered as an inviscid fluid.

Although the pressure-changes about an aircraft at supersonic speeds occurred sufficiently rapidly for them to be audible, he continued, it must be emphasized that the sonic bangs were due to shock-waves, for the shock-waves represented the regions about an aircraft where the pressure varied most rapidly—in fact, discontinuously. Moreover, the pressure-changes involved, although aerodynamically small, were large by acoustic standards. For example, a bang corresponding to a pressure of 1 lb/sq ft represented a sound of 130 decibels above the audible threshold, although it represented an aerodynamic pressure coefficient of only about 0.001.

To calculate the noise intensity due to an aircraft travelling at supersonic speeds, the shock-wave pattern around the aircraft had to be known. This was known reasonably well for aircraft travelling at uniform speeds, but for general (non-uniform) motion, the patterns were exceedingly complex, and had as yet received little attention. However, a rough qualitative picture of the mechanism of the sonic bang could be obtained by using the methods of small-perturbation theory, in which the aircraft itself was represented by a simple distribution of sources and sinks.

Using this theory, it followed that an observer would experience a bang from every occasion on which the aircraft was flying such that its component of velocity in his direction was sonic. The use of this observation to predict the number of bangs to be expected on any occasion must be treated with caution, however. Explanations of multiple bangs, also, were highly conjectural in the absence of complete knowledge of the motion of the aircraft: it was probable that different explanations were appropriate to different occurrences.

Concerning the intensity of the bang, the small-perturbation theory predicted that, all other things being equal, the pressure was proportional to the linear dimension of the aircraft to the power one-half, was inversely proportional to the distance of the observer from the aircraft when its speed towards him was sonic, and was roughly inversely proportional to the square root of the radial acceleration or deceleration at the same instant.

These results explained why aircraft caused more intense bangs than bullets or shells, although among themselves aircraft differing by a factor of ten in all-up weight would cause bangs differing by only three decibels. They indicated, also, how bangs of enhanced intensity might result. For example, steady flight at Mach number unity would result in an enhanced-intensity bang to observers on the line of flight, and in non-rectilinear supersonic flight such bangs were always possible owing to the "focusing" effects of concave shock-wave patterns. Such enhanced bangs would, of course, be extremely localized.

After referring to the College of Aeronautics' report, *Some Aspects of the Noise Propagation from Supersonic Aircraft*, by Lilley, Westley, Yates and Busing (an extensive review of which appeared in last week's issue of *Flight*), Mr. Warren went on to consider the probable effects of sonic bangs. Assuming that the pressures involved were only of the order of 1 lb/sq ft, he stated, then even with a tenfold increase in this figure, one could not normally see such a pressure causing material damage to any well-built structures. As a source of noise annoyance, however, bangs of an intensity corresponding to 1 lb/sq ft could be disturbing. The nuisance would be encountered in the immediate future near airfields from which there was supersonic test flying, but in the not-too-distant future would be much more widespread. For example, a supersonic civil aircraft, flying along peacefully at what one would imagine to be a reasonable height of 20,000ft, would cause bangs of an intensity corresponding to 1 lb/sq ft at all points along its path as it flew overhead.

So far, the pressures at relatively large distances from the aircraft had been considered. To understand what happened at closer distances—for example, if the aircraft flew low or passed another aircraft—it was necessary to appreciate the essential differences between subsonic and supersonic speeds. An aircraft in flight was supported ultimately by the ground through the pressures induced on it by the airflow about the aircraft. At subsonic speeds these pressures were spread over a fairly wide area, but it was known that at supersonic speeds they were contained within the area between the two main shock-waves. Admittedly the shock-waves from an aircraft diverged, but one could see that, at close distances, pressures on the ground must tend to those corresponding to the wing loading of the aircraft for, crudely, the aircraft was being supported entirely by the ground between the two main shock-waves.

Unlike engine noise, the speaker concluded, nothing could be done in design to reduce the noise due to sonic bangs, and the control of this source of noise would have to come from control over supersonic flying.

Aircraft-noise Discussion.—First speaker in the subsequent discussion on aircraft noise was Mr. Alan Yates, of the College of Aeronautics, who referred at length to the first published accounts of thought on supersonic bangs, in *Flight* last year. After commenting on the absence of any theoretical forecast of bangs, he emphasized the importance of the critical Mach number—and of the regulation of bang-provoking flight, for he himself was a member of the Bedfordshire County Council and aircraft must not break his constituents' windows. Mr. Greatrex asked for a simplification of the Lighthill theory quoted by Mr. Lilley, and went on to give details of the cabin noise—which was aerodynamic—experienced on the Canberra. He thought the conception of low-altitude level supersonic flight was exaggerated.

Dr. Richardson (King's College, Newcastle) referred to the possibility of the scattering, or smoothing-out, of noise with turbulence, similar to the scattering of light in fog. Work at Southampton University on turbulence and variation of frequency with velocity was then described by Mr. Powell. Mr. Brown (de Havilland Aircraft Company) gave his personal observations on aircraft diving supersonically, and thought that a bang might be due to an instantaneous effect rather than a continuous one. Mr. Handel Davis (A. and A.E.E., Boscombe Down) agreed that bangs were undoubtedly associated with shock-waves, and admitted that his original acoustic theory had proved a red herring. He, also, doubted the present seriousness of the problem of damage due to bangs.

In reply, Mr. Lilley apologised for including the Lighthill theory, but said that this had been necessary to show what had been done. It was possible to obtain simpler laws, however, and in general they seemed to agree in practice. After replying to other specific points, he emphasized that, from this work on high-speed jets, new theories of edge tones were arising.

Mr. Warren agreed that it was surprising that no forecast of bangs had been made, although Prandtl had performed some relevant work on shock-waves in 1938. The rear shock-wave of an aircraft had not been experienced by ballisticians, for the shock-wave from the explosion dwarfed the rear wave normally left behind which was, of course, the interesting one in the aircraft case. The time interval in a double bang was entirely a function of the period of time for which the aircraft had been flying supersonically, he continued. The instantaneous puff of vapour sometimes observed in a supersonic dive was presumably associated with the supersonic phenomena, but this did not dispute the contention that a bang was continuously created.

It was difficult to fly at exactly Mach 1 in order to study the noise heard under this condition, the speaker affirmed. Relatively little research into the cause of bangs had taken place in the U.S.A., as their supersonic flying generally took place over unpopulated areas and caused very little nuisance to the general public. He agreed that low-altitude supersonic flight was not very likely in the immediate future for civil aircraft, but the military application remained. The sonic bang, he concluded, was analagous to the discharge of lightning from a cloud to the ground.

GROUND NOISE

Ground noise was the third main subject, under the chairmanship of Mr. G. E. Bell (of the M.C.A.), and the first paper in this phase of the meeting, *Air-to-ground Noise*, was presented by Mr. N. Fleming, of the National Physical Laboratory.

Air-to-ground Noise.—Mr. Fleming first emphasized that his main concern was the measurement of such noise, in particular the techniques of measurement and the results obtained.

The uses of accurate measurement, he continued, were to discover the degree of noise reduction necessary, to study the source of the noise, and to devise particular methods for noise reduction. One single measurement could not convey much, however, and some form of analysis was often needed. Nuisance-value was clearly not amenable to direct measurement, but it did depend largely on loudness—which could be measured. Air-to-ground noise was further complicated by its fleeting, variable nature, and required some form of automatic recording for a full understanding.

A 70-phon weighted value of the sound pressure level had been adopted, and in the actual tests described by the speaker the r.m.s. signal from an amplifier was measured and recorded directly in decibels. The first results shown referred to tests with a single-engined helicopter, and the sound level was shown plotted against time (also expressed as distance), for five heights from 125ft to 2,000ft. The maximum sound was experienced shortly after the aircraft passed overhead, at an angle of about 20 deg to the vertical.

There were two methods of analysis. The first covered 27 frequency bands, and a ciné-camera recorded the results from a cathode-ray screen at a speed of 20 frames per second, the maximum range being 25 decibels. Disadvantages of this method, however, were that the range was reduced due to the inability to preset accurately; random fluctuations gave frame-to-frame variations, and the work required in measurement and in setting the film records was excessive. The second method used three recording sets, each continuously recording the sound pressure level over a frequency band one octave wide. Two runs of the aircraft could give all the results normally required, or three runs could cover eight octave bands.

Typical aircraft noise analyses were then shown by the speaker: the low-frequency noise from the jet was seen to increase as the aircraft passed overhead, and to reach a maximum some distance beyond this point. At low engine speeds, the impeller noise predominated as the aircraft approached, the frequency varying due to Doppler effect.

Tabulated results then indicated the maximum sound level and loudness level on the ground from each of five types of aircraft in cruising level flight overhead. Measurements of sound level (decibels) and loudness level (phons) at altitudes between 100ft and 5,000ft illustrated the differences between types, such as those due to various designs of exhaust systems.

Mr. Fleming concluded, "The reduction of noise on the ground can follow from the reduction in noise produced or in screening of the exhaust system; this second method should be put into force wherever possible."

Ground-to-Ground Noise was the title of the final paper, presented by Mr. J. D. Hayhurst, B.Sc., A.F.R.Ae.S., of the Ministry of Supply. The problems of noise on the ground coming from aircraft on the ground, he began, although not simple, were rather less difficult than those associated with the noise from aircraft in flight. The main problem was that of dealing with the noise of a stationary aircraft, with the possibility of the engines being run continuously for an hour or more. The aircraft was available for noise abatement treatment subject to the requirements of the ground engineers working on it, to the requirements that the engine performance must not be so altered that correct functioning could not be checked, to those of the operational staff who had to have the aircraft ready to receive passengers soon afterwards, and to the accommodation available in the maintenance area.

When the engines were running, the noise radiated would vary round the aircraft, depending on the engine operating conditions. On a turbine-engined aircraft, the noise would come from both the intakes and the jet nozzles. The jet noise would be predominantly low-frequency, causing the familiar roar, and would increase with increasing engine speed. For an engine with a centrifugal impeller, the intake noise would be predominantly high-frequency, and greatest at medium engine speed, decaying thereafter as the engine speed was increased. At the maximum engine speed, the combined effect would be a low-frequency noise, with the greatest intensity in a rearward direction, making an angle of approximately 45 deg with the aircraft axis. At medium engine speeds, the

AERONAUTICAL ACOUSTICS . . .

combined effect was a high-frequency noise, greatest in a direction directly ahead of the aircraft. An engine with an axial compressor gave a similar pattern at maximum engine speed, but there was much less pronounced high-frequency noise at lower engine speeds.

Before considering possible forms of treatment for noise abatement, the speaker continued, it was pertinent to examine just how the noise decreased with increasing distance from the aircraft. The term "noise" had to be discarded as a physical characteristic, for noise was a subjective feature that could not be precisely defined. An appropriate analysis must refer instead to sounds formed of an aggregation of tones and different frequencies. Grouping the frequencies into consecutive bands, usually octaves, and taking in each octave the sound intensity (or pressure) level per octave in decibels above the conventional datum, enabled an objective pattern to be established. Combining the intensity level in decibels into a loudness level in phons led to a subjective presentation which could be appreciated.

As an example, one could assume that at a distance of 100ft from an acoustic source the sound intensity in each of eight octaves was 100 decibels, i.e., the spectra was flat. This emission was known colloquially as "white" noise. The total intensity would be 109 decibels and the loudness level 125 phons. At 200ft the total intensity would have fallen to 103 decibels by application of the inverse square law of energy radiation, which for sound gave a drop of six decibels each time the distance from the source was doubled. At 400ft the total intensi y would have fallen to 97 decibels, and at 1,000ft to 89 decibels, made up of 80 decibels in each octave. The corresponding loudness level would be 101 phons, so that in 900ft there had been a drop of 20 decibels in total intensity and 24 phons in loudness level.

To these decays could be added the effects of the atmosphere through which the sound was travelling, assuming first that there was no absorption by the terrain, nor any absorption, reflection or screening from high objects. It was a feature of the transmission of sound that the higher the frequency the larger the effect of any imposed condition. The atmosphere affected the transmission of sound by absorption, by dissipation caused by turbulence, by refraction caused by wind, temperature and density gradients, and by the translational effects of wind. There were also other effects which could hardly be forecast.

Mr. Hayhurst then considered in detail the effects of atmospheric absorption, wind, and the terrain, and then gave his personal views on the problem of noise abatement. The fitting of ground silencers to piston-engined aircraft would be extremely difficult, as equally effective treatment of airscrews and exhausts would be necessary. Jet aircraft, he stated, offered greater scope than piston-engined types, since the sources of noise were more compact. Investigations were taking place to find whether mobile detuners for exhausts and intakes were practicable; this type of device had already been used in the United States, but had been limited there to single types of aircraft, and the arrangement had not been really suitable for everyday use in a busy maintenance area.

The use of obstacles offered wide scope, but there was the limitation that the obstacles screened only a certain sector around an aircraft. The greatest advantage then would be obtained by having the aircraft as close to the obstacle as possible, but one could not completely surround the aircraft because of the need to disperse the slipstream or the jet efflux.

A good form of obstacle was provided by a running-up pen. It had been shown that reductions of up to 25 phons could be obtained in this way, a reduction which represented a real measure of noise abatement. There still remained attendant problems to be explored, for example, the manœuvring of aircraft into and out of the pen, and the effect on the airflow into the intakes of jet engines might present serious difficulties, but as the advantage of a running-up pen was equally effective for all types of aircraft, further investigation was certainly warranted.

Trees had also been considered as a means of screening noise. They would certainly help, provided that they could be planted in the right place and to the necessary thickness, that they retained their leaves throughout the year, and that they did not infringe the safety clearances required on approach and departure lanes for aircraft.

The variation of noise level around an aircraft, already mentioned, could also be utilized. By so orientating the aircraft that the directions along which the lowest noise levels were found fell on the areas where noise might be disturbing, a measure of alleviation would have been achieved. At the same time, this method might be limited by having to face the aircraft either into wind or so that the jet efflux was directed away from particular parts of the maintenance area. These, the speaker concluded, were the available methods. They had their limitations, but they did admit some possibility of alleviating noise.

The general discussion on the ground-noise papers of Mr. Fleming and Mr. Hayhurst began with a question from Professor Richards concerning a type of ground muffler fitting around both jet nozzle and intake to give a 30-decibel reduction; surely this was impracticable in busy traffic conditions, and also on the grounds of expense. But we did understand more about where the noise came from, he continued, and so it should be possible to design effective ground silencers. Mr. Briscoe, of the M.C.A., stated that the annoyance caused by the noise had not been measured; this was especially important in connection with the civil helicopter which would have to serve centres of population. The noise level from an aircraft should not be louder than that due to a bus passing along a street, i.e., about 85 decibels. Mr. King (Metropolitan-Vickers) mentioned the wide frequency band (100 c.p.s. to 10,000 c.p.s.) encountered with jet engines, and suggested for reasons of economy in space that low-frequency and high-frequency absorbing systems might be combined in cascade.

The subjective nature of noise was referred to by Mr. Rendall (R.A.E.), who said, also, that information on noise radiation was particularly wanted. Professor Cave-Brown-Cave (late of Southampton University), spoke of the effect of noise on the nervous systems of the victims: the best approach was to explain the reasons for the noise, to point out that it was inevitable, and to state that active efforts to reduce the noise were being made. Other suggestions made by speakers were for co-operation between engineers and aviation medicine experts, and for the elimination of noise of particular frequencies.

Replying, Mr. Fleming agreed that the nuisance value of noise differed with people and circumstances, and could be measured only by using a large number of observations. It might not be very important, however, necessarily to give an exact figure to this nuisance. Particular designs of silencing ducts, incorporating splitter vanes, would certainly be efficient but might not prove economic.

Mr. Hayhurst emphasized that the difficulty in constructing efficient test houses was different from the problem worrying the airport authorities. A smaller reduction in noise would be acceptable for airports, although, in view of the complaints received, the airport authorities would have to take definite steps towards noise abatement. The operators also should give thought to this now.

DISCUSSION on DAY'S PAPERS

After tea, a general discussion on points arising from the day's acoustic topics was held. Professor Richards, answering a speaker who suggested that low-frequency vibration would not only cause passenger discomfort but be damaging to electronic and other instruments, pointed out that this type of vibration had been at its strongest with the piston engine and that the introduction of propeller turbines and turbojets should give a longer life to instruments and hydraulic pipes. In any case, the distribution of amplitude and frequency of the noise around a jet had been studied and critical equipment should be suitably located.

Discussing helicopter noise, Dr. G. Hislop (Fairey Aviation Co.), emphasized that permission to operate helicopters to the centres of cities was important and he wondered if some of the figures of noise limits which had been mentioned (e.g., 85 db at 150ft from the rotor) were not too strict. During the B.E.A. night mail operations, nearby houses had been subjected to 90-100 db and no complaint had been received. The tolerable noise level differed with frequency: Dr. Hislop mentioned that a Comet passenger had reported that the cabin appeared quiet, but that the noise had a deadening effect on the speech frequencies. Perhaps, on this count, it would be undesirable to relax the standards laid down at the high frequencies, as had been suggested.

In an amusing contribution to the discussion, Mr. H. Caplan (British Aviation Insurance Co.) claimed that the best units of measurement of noise were the number of complaints received per month. His company were, naturally, very interested in the noise problem (especially in "bangs"), but he regretted that he had doubts about certain complicated mathematical equations. Mr. Woodward-Nutt (Ministry of Supply) thought that the sonic bang story had been "oversold," that supersonic speeds low down would not be with us for a very long time and that flying discipline could deal with the problem. Mr. Warren disagreed, stating that sudden noise was always objectionable and the bangs might have serious results when nerves were tensed by some other cause. Prof. Richards confirmed that many Southampton people had been "put out" by bangs recently heard there.

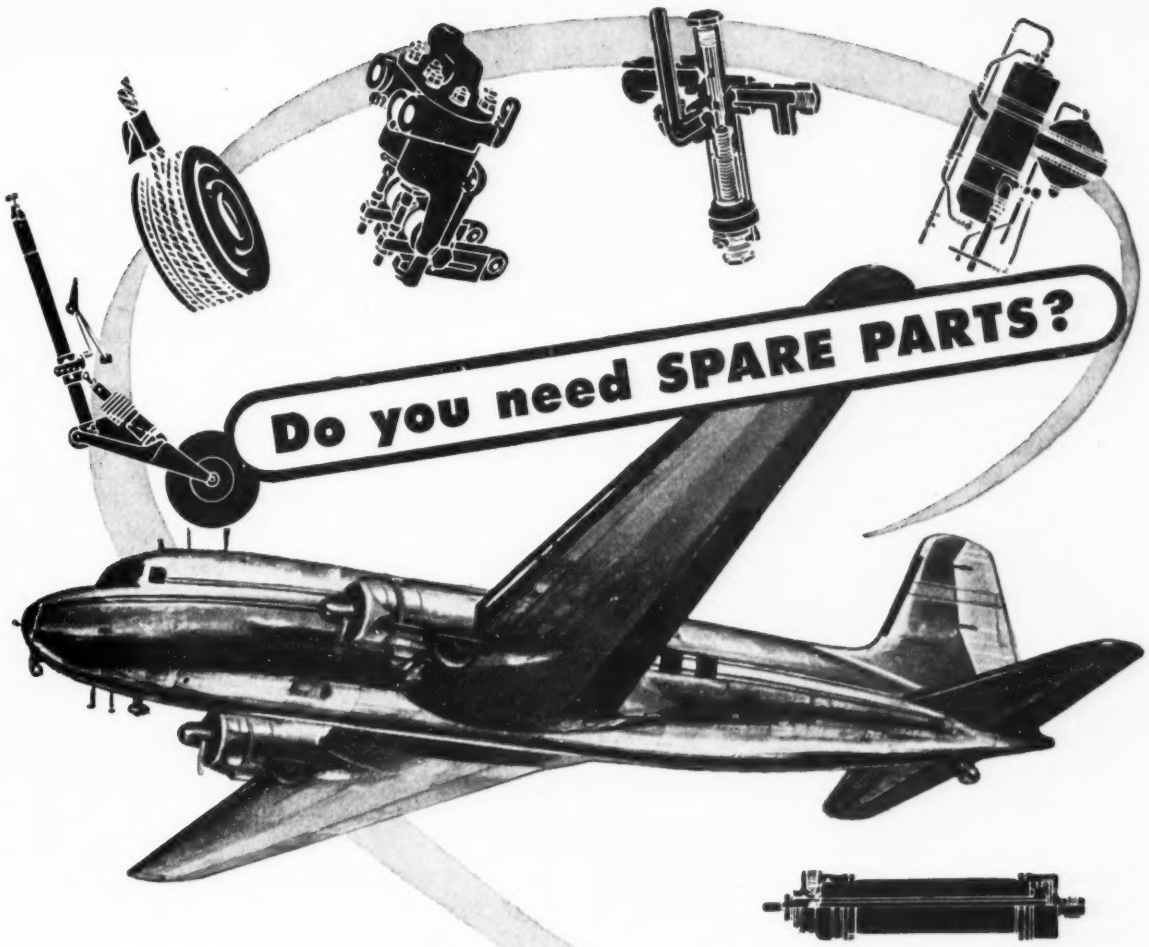
BELGIAN PRINCE AT HAWKERS

FOLLOWING the visit of the Duke of Edinburgh to Hawker Aircraft, Ltd., as described in *Flight* of May 29th, the company was again honoured on June 4th, this time by a visit from Prince Albert of Liége, brother of King Baudouin of Belgium. The Prince and his party arrived at Dunsfold during the morning and visited the control tower before inspecting the Cygnet, Tomtit, Hart, Hurricane, and finally a Hunter F.2 (Armstrong Siddeley Sapphire).

His Royal Highness sat in the Hunter's cockpit, vacating it to allow Neville Duke to take off. Meanwhile, he saw a display by the Cygnet, Tomtit, Hart and Hurricane. By this time Neville Duke had attained a level of about 40,000ft, and within a few seconds a terrific supersonic bang was heard. Later he made several runs and rolls above the airfield. Having congratulated the Hunter's pilot, Prince Albert and his party took lunch with the directors of the company.

GERMAN RESEARCH PLANS

WEST GERMAN radio has been devoting much time to publicizing the Goettingen conference of the Society for Aeronautical Science. On May 28th a report was broadcast that Dr. Seebohm, the Federal Transport Minister of the Bonn Government, had stated that it was proposed to set up a research nucleus which would be concerned with training a young cadre of specialists. The various Laenders (provinces), he added, should set up suitable institutes as well as university chairs for acronautics. Young engineers would be given three- to five-year courses in the first phase of the programme; the second phase would be concerned with reorganizing the experimental side. It was the special task, in this phase, to keep alive the seven research institutes which had never ceased to exist in law. Efforts should be made to retrieve lost equipment and the valuable aviation research libraries which had been taken abroad by the occupying powers.



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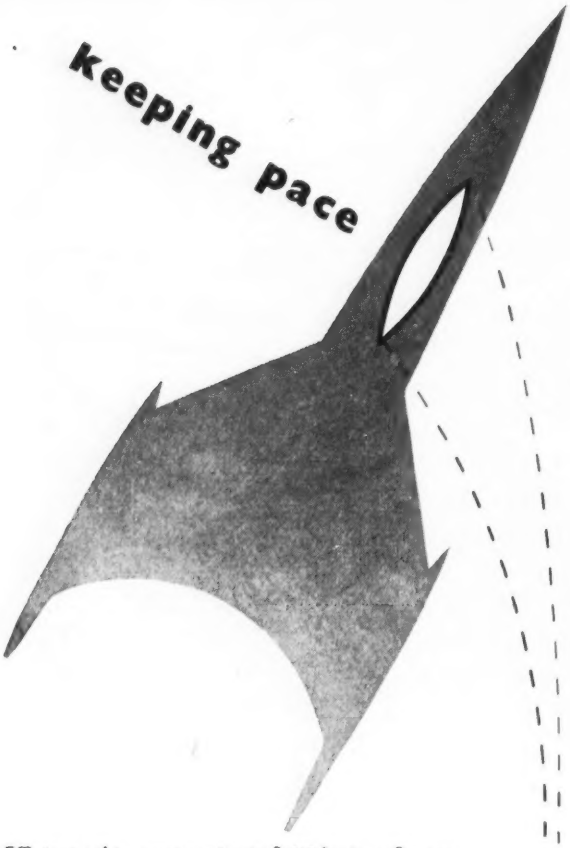

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THE INDUSTRY

Lighter Magnets

A METHOD of constructing permanent magnets from ultra-fine iron dust, instead of the conventional cobalt steel, has been devised by the General Electric Company: Gecalloy magnets, as the new products are to be called, are now in production in Lancashire by the Salford Electrical Instrument Co., Ltd., a subsidiary of G.E.C.

The magnets are made by moulding together iron particles which have about one-thousandth the diameter of any previously available, such minute particles being necessary for making permanent magnets; producing this powder, and handling it in such a way that it does not spontaneously catch fire in the air, has presented considerable problems, all of which, it is stated, have now been solved.

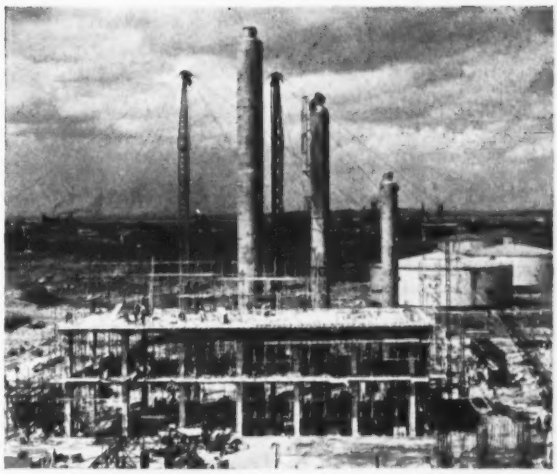
The particles are insulated from each other by mixing with a special fluid before pressing, and there are therefore no eddy currents in a Gecalloy magnet. The two main advantages of the product, however, are that weight is approximately halved for a given mechanical strength (an important point in aircraft installations) and that shaping processes other than the relatively slow and expensive casting and grinding can be used, thus permitting an unusual range of shapes to be fabricated and at the same time providing the opportunity for appreciable reductions in cost when production gets well under way.

Versatile Servicing Vehicle

SPECIALISTS in garage and other servicing equipment, the firm of Equipment Repairs, Ltd. (19-20 The Viaduct, Alperton, Wembley, Middlesex) now have in production a range of mobile servicing units which should have a number of applications in the aircraft industry; and airline operators, also, might well find them useful in a variety of maintenance work, as would airfield-construction contractors for the servicing of their mechanical plant.

The principal duty of these units is to dispense, from a single mobile source, a variety of oils, greases, etc., together with paraffin and a compressed-air supply. In each case the required fluid is supplied under pressure through a hose, and when not in use the hoses are reeled on drums. A small petrol engine supplies the necessary pumping power, and the whole assembly, including the hose reels, is neatly accommodated in a two-wheel trailer with roof and side shutters.

Fourteen of these trailers were supplied some time ago to the Anglo-Iranian Oil Co., Ltd., for the maintenance of refinery plant, and recently a new design has been developed to the oil company's special requirements. Equipment Repairs, Ltd., make a special point of the fact that the mobile plants can be designed in conformity with specific needs.



HIGH-OCTANE AVIATION SPIRIT will be produced by this new "platforming" unit at the Shell Refinery at Stanlow, Cheshire—the first such unit to be erected in the United Kingdom. A "platformer" is so called because it uses a platinum catalyst to re-form low-grade petrol into high-grade fuel.

Hymatic "At Home"

FRIENDS and relations turned out in strength on a recent Saturday afternoon to support an employees' "At Home" held in the Redditch factory of the Hymatic Engineering Company, Ltd., the compressed-air-equipment specialists. At least three-quarters of the staff voluntarily gave up their free time to demonstrate machinery, explain various processes and to help generally in entertaining the 800 to 900 visitors.

Each department prepared its own display and demonstrated production and office machines. In the experimental section the whole range of equipment was used to illustrate the processes involved in product research and development, whilst the design office was laid out to show the stages in the evolution of a design and the discarded "first and second thoughts."

IN BRIEF

Elliott Brothers (London) Ltd., have opened a new and larger Newcastle branch office at 36 Scotswood Road (Newcastle 23811).

* * *

As from today, June 12th, the Spray Packaging Division of R. A. Brand and Co., Ltd., moves to 72-75 Red Lion Street, London, W.C.2 (Chancery 2605).

* * *

The British Welding Research Association has produced a neat comparator for determining basic characteristics of mild-steel metal-arc welding electrodes; it is obtainable at 5s. from the Association's H.Q. at 29 Park Crescent, London W.1.

* * *

British Emulsifiers, Ltd., aeronautical and general engineers, announce appointments of Mr. G. A. Rickards as chairman and Messrs. L. D. Bennett and L. G. Harris as joint managing directors; other directors are Messrs. E. C. Burrell and J. H. Stark. The offices are at 45 Park Lane, London, W.1 (Grosvenor 8814).

MR. E. MORGAN, B.C.S, A.M.I.E.E., appointed senior liaison engineer of the Plessey Company's components division. Until recently he was with the B.B.C., in technical posts concerned with transmission; before that he was on the technical sales staff of Osram Valves (G.E.C.).

Industrial ventilation and other fans covering a very wide range of types and sizes are described and illustrated in the "Red Book" catalogue recently issued by the Airscrew Co. and Jicwood, Ltd., Weybridge, Surrey.

* * *

Saunders-Roe, Ltd., announce that the Rev. R. V. Scruby, at present curate of Rogate in the diocese of Chichester, has been appointed the company's chaplain. He has had engineering training, and it is felt that his appointment will be particularly helpful in the apprentices school.

* * *

From P. W. Greenwood (Willesden) Ltd., 62 Shirland Road, London, W.9, comes a copy of their latest stock-list of aeronautical equipment, which consists mainly of unused R.A.F. surplus goods in their original packing. These items can be supplied certified to A.R.B. and A.I.D. specifications; many of them are held in four-figure quantities.

* * *

Mr. W. E. P. Johnson, A.F.C., managing director of Power Jets (Research and Development), Ltd., lectured recently to students of the College of Aeronautical and Automobile Engineering, Chelsea. Mr. Johnson's talk—the fifth in a series currently being given to the students by men distinguished in aircraft and automobile engineering—was on the development of the aircraft gas turbine.

* * *

Recent publications of new British Standards by the B.S.I. (24 Victoria Street, London, S.W.1) include B.S.G. 144 : 1953, *Direct-reading Pressure Gauges for Aircraft* (price 1s), and B.S. 233 : 1953, *Glossary of Terms Used in Illumination and Photometry* (price 3s 6d). The pressure-gauge standard relates to hydraulic and pneumatic systems, and to brake reservoirs, for pressures of 100 lb/sq in upwards: it does not apply to oxygen-system gauges.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

By Any Other Name . . . ?

READING of the capacity of the new Waterloo Air Terminal recently, it was brought home to me that a new word is needed to explain the process of getting passengers through the various departments from the time of reporting to that of embarkation in the aircraft—or the other way round. When talking about the numbers of air travellers using an air station, the horrid expression that "so many are *processed*" seems to be creeping into common usage. Personally I would rather be serviced, or even handled, than treated like cheese.

The professions and other spheres of interest offer little help towards an appropriate and pleasant term; passengers are not really conveyed at this stage, nor, we hope, are they despatched or transacted. Some are shepherded, others husbanded maybe, and a few even manipulated. Of all the words which have occurred to me so far I think perhaps forwarded is the most simple, pleasant and descriptive, though even this is suggestive of baggage and letters and arrival at the wrong address.

London, W.1. M. ARMSTRONG.

Alternative Theory

YOUR leader of May 8th contains a rather hurt note in the second paragraph, which makes me grin slightly. True, the "British general public" is vaguely windy about "flying." I fancy, however, that the "general public" of practically every population-group in the world today is a bit doubtful about the value of "flying." Your socio-psychological theory about the causes of this deplorable frame of mind—that stuff about the British Islanders being used to the dear old railways, steamers and buses, and not liking anything "newfangled" such as "flying"—seems to me as weak as the notion that the "natives of wild or undeveloped countries" welcome aircraft . . .

I have an alternative theory about the suspicious attitude of the "general public" (i.e. I presume, anybody who doesn't make a living out of "flying") which may bear scrutiny. It is this: that so far, "flying" has constituted one of the most destructive, wasteful and terrifying curses ever inflicted on the "general public" by the wealthy and money-powerful minority, and has conferred the boon of moving at a few hundred miles an hour through the air (if one likes that sort of thing, which—dare I mention it?—not everybody does) upon a tiny minority of even the "civilized" populations, and then mainly for the purpose of dropping high explosives on the luckless terrestials or machine-gunning them.

True, pictures of the interiors of passenger-carrying aircraft look rather like luxury trippers' coaches, but one can obtain equal comfort for a few shillings on any of the Sunday excursion buses, and to take a trip in an aircraft costs a quarter's salary of the average land-bound creature. So, although "flying" is great fun for the few, the vast majority doesn't see so very much in it.

As for "natives," I somehow have the curious feeling that perhaps the descent of napalm bombs from the sky, and the sight of very wealthy Chinese, Japanese, and Indian magnates travelling "all same White Massa" doesn't really make "natives of wild, undeveloped countries" love aircraft.

However, it won't last for ever. A few weeks ago I saw a tiny paragraph announcing that the Petroleum Board had reported that, at the present rate of consumption, the world's oil reserves would be exhausted in 25 years. If that is true, I don't suppose the "general public" or the "natives" will shed a single tear over it.

Wyton, Hants. W. H. CAZALY.

Koolhoven Aircraft

IN response to the request of your correspondent Mr. J. G. Gaylard (May 8th issue), for the identity of the young man sitting in the Crow's nest of the Koolhoven F.K.28, this happens to be an old Koolhoven colleague of mine, Capt. Cecil Vaughan, late R.N.A.S. and R.A.F. Somewhere in my archives I have this same picture in a catalogue issued by British Aerial Transport, Ltd. Vaughan was test pilot for Fritz Koolhoven at this time, in England. Later, in 1923, he joined us in Holland and I had the breezy pleasure of flying with him on many occasions.

May I suggest to your historian, Mr. J. M. Bruce, that he make some attempt to trace the chequered history of this versatile designer's creations? While, from a purely technical aspect, the jovial (and temperamental) Dutchman was something of a blacksmith, none the less he was a richly experimental one, with a leaping mind that often scorned the conventional. The B.A.T. Bantam, for instance, suffered from catastrophic instability (it was wonderfully stable on its back!), but it was an outstanding milestone in the design art for all that. "Kully," moreover, was probably the first biplane designer to combine a beautifully stiff wing structure with a wide-track landing gear. Unfortunately, in the case of the Bantam, one of his bright young technicians slipped up on the c.g. location—it was much too far aft. The vertical keel area was also deficient in a spin—it needed a ventral fin and rudder after the fashion of the Factory's S.E.4 and S.E.5

The reason I suggest this research is because a considerable number of Koolhoven's experimental one-off designs have never been illustrated in the literature. (It is highly likely that some o them never flew!) I have long suspected this because I once came across Kully's personal photo album and I was astonished at the unorthodoxy displayed therein. (What other designer has ever had the impish curiosity to produce a quadruplane—just to put one over on Sopwith and Fokker!) About the best clue I can suggest to your historian-contributor is to get in touch with Mme. Koolhoven (a charming Belgian lady), possibly through the good offices of Mr. C. G. Grey. If these pictures could be unearthed, I fancy some of your readers will be as startled as I was some 30 years ago.

Santa Monica, U.S.A. STANLEY H. EVANS.

[While this letter was on its way from America we published—in last week's issue—several others identifying the pilot as Capt. Vaughan.—ED.]

Logical?

THE problem of a suitable name for helicopter landing sites is still unsolved; and horrible words like "heliport" and "rotorstation" are still being bandied to and fro.

Many years ago the railway companies adopted the name of "railway station," which is defined by the Oxford Dictionary as "a stopping-place on the railway, with buildings for accommodation of passengers and goods . . ." In this they were wise. They do not need to spend time wondering whether they should call a place a steam-train station, a diesel-electric-train station, a gas-turbine-train station, or even an atomic-train station. Whatever type of train uses the station it is still a railway station.

Would it not be simpler to settle on the term "Airway station"?

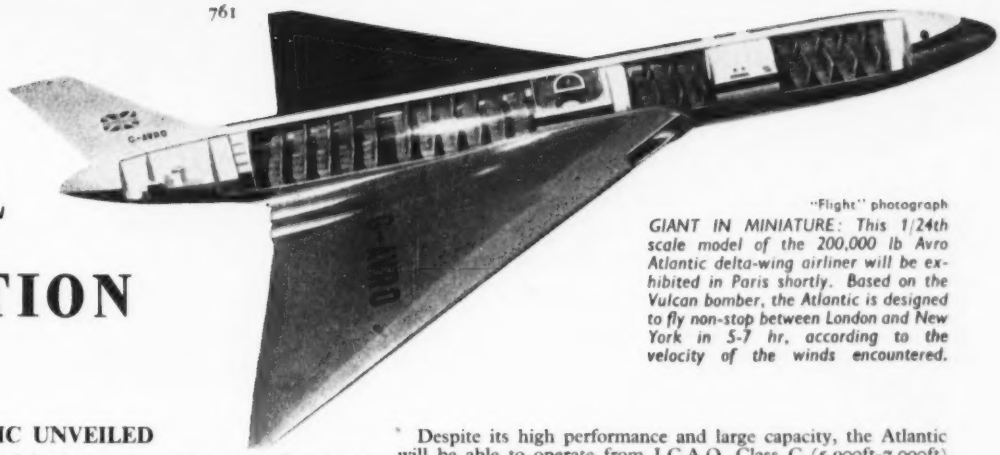
NORMAN JENKS.

[But would this allow for the fact that railway stations do not differ from one another so widely as airports differ from helicopter landing-sites?—ED.]

FORTHCOMING EVENTS

June 13. "At Home," R.N. Air Station, Lee-on-Solent.
June 13-14. Aero-Club d'Italia: Air Tour of Sicily.
June 13-14. Rhodes Centenary Air Display and Rally, Salisbury, Rhodesia.
June 14. Aero-Club de Tangier: Tangiers Rally.
June 14. R.Ae.S.: Garden Party, Hatfield.
June 15. Coronation Naval Review.
June 16. I.C.A.O.: Opening of Seventh Assembly, Brighton.
June 17. Women's Engineering Society: Annual General Meeting.
June 17. Aircraft Recognition Society: Special General Meeting.
June 19. Institute of Navigation: "Accuracy of Wind Forecasts for Aviation," by C. S. Durst and D. G. Harley.
June 20. "At Home": R.N. Air Station, Culdrose.
June 20-21. Aéro-Club de l'Ouest de la France: Anjou Wines Rally.
June 20-21. Aéro-Club de Flers de l'Orne: Normandie Rally.
June 20. Southend Corporation and R.Ae.C.: National Air Races, Southend Airport.
June 21. Southern Aero Club: "At Home," Shoreham.
June 21. Aéro-Club des I.S.P.A.: Display, Marq-en-Bareuil, Lille.
June 26-July 5. Paris Aero Show.
June 25. College of Aeronautics, Cranfield: Presentation Day and Ball.
June 27. Official opening of Ramsgate Airport and Flying Club.
June 27. "At Home," R.N. Air Station Bramcote.
June 27. Aéro-Club d'Eure et Loire: Chatres Rally.
June 27. S.L.A.E.: Annual General Meeting.
June 27-29. R.Ae.C.: Members' La Baule Rally.
June 27-30. Aero-Club di Livorno: International Rally.
June 29. Combined R.Aux.A.F. Units: Ball.
July 4-6. R.Ae.C.: Members' Deauville Rally.
July 9. Jersey Air Display.
July 11. "At Home," R.N. Air Station Anthorn.
July 11. Auster Flying Club: Display.
July 12. Northern Heights Model Flying Club: Gala Day.
July 15. Royal Air Force Coronation Review.
July 18. Vintage Aeroplane Club: Rally, White Waltham.

CIVIL AVIATION



"Flight" photograph

GIANT IN MINIATURE: This 1/24th scale model of the 200,000 lb Avro Atlantic delta-wing airliner will be exhibited in Paris shortly. Based on the Vulcan bomber, the Atlantic is designed to fly non-stop between London and New York in 5-7 hr, according to the velocity of the winds encountered.

AVRO ATLANTIC UNVEILED

FURTHER details of the Avro project for a 100-ton long-range airliner based on the delta-wing Vulcan bomber were announced earlier this week by Sir Roy Dobson, C.B.E., managing director of A. V. Roe and Co., Ltd. Sir Roy stressed that the aircraft, which will bear the name Atlantic, was still in the project stage: "We are much too busy at the moment building Vulcans for the R.A.F. But airlines all over the world have been asking for details of the inevitable transport sequel. . . ."

The unique claim is made for the Atlantic that it will fly non-stop from London to New York, cruising at over 600 m.p.h., at an operating cost (based on the latest S.B.A.C. method) of 7d to 10d per long ton-mile and less than 1d per passenger-mile. The Atlantic's payload will vary between 10 and 20 tons over stage lengths of 1,500-4,000 miles. No reference is made to the type of turbojet which will make possible this outstanding performance. Production Vulcans for the R.A.F. will have four Bristol Olympus rated at well over 10,000 lb per unit.

A model of the Atlantic takes the form of a long, slim fuselage (not unlike that of the Britannia) mounted on a delta wing of Vulcan configuration. To be exhibited at the forthcoming Paris Salon, the model shows one of three proposed seating layouts—the 94-seat basic version; alternatives are the 76-seat luxury version and the 113-seat tourist layout. The pitch of the rearward-facing seats remains constant at 42in, and these variations are made possible by fitting four, five or six seats abreast according to the density desired. In each case "tube effect" is prevented by the central positioning of bar, lounge and toilets, dividing the cabin into three sections. All the seats are forward of the cone of noise from the four jet orifices. The forward, centre and rear compartments have capacities of, respectively, 1,500, 1,000 and 3,340 cu ft; capacities of the under-floor freight and baggage compartments are 1,260 cu ft (forward) and 670 cu ft (rear).

The cabin is, of course, pressurized, equivalent altitude at 45,000ft being 8,000ft. The close relationship between the Atlantic and the Vulcan (which, incidentally, is bound to reduce the time and cost of development) means that details of performance and construction are partially screened by security. However, it is stated that the Atlantic will attain a practical cruising speed of M=0.9. All fuel is carried in the wings (in flexible tanks), which are stated to incorporate new methods of construction. Rudder, elevator and aileron controls are aerodynamically balanced, and operated by electro-hydraulic power-units embodying artificial feel. The undercarriage, of multi-wheel bogie type, will be fitted with Maxaret braking units.

Despite its high performance and large capacity, the Atlantic will be able to operate from I.C.A.O. Class C (5,900ft-7,000ft) runways; the corresponding minimum-strength classification is Class 4 (single-wheel loadings of up to 45,000 lb). Weight and dimensions are: gross weight, 200,000 lb; span, 121ft; length, 145ft; fuselage diameter, 12.5ft.

20 NORATLAS FOR BRAZIL

THE Brazilian company Aerovias Brasil has ordered 20 Hercules-powered S.N.C.A.N. Nord 2501 Noratlas twin-boom transports as replacements for its DC-3s. An aircraft of this type, which may also be ordered by the Brazilian Air Force, has just completed a South American sales tour.

FREIGHT SERVICES APPROVED

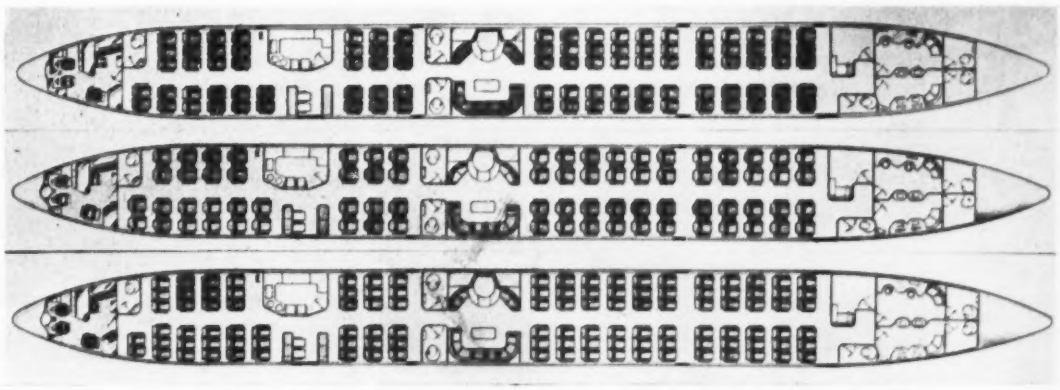
CONDITIONAL approval is announced by the M.C.A. for applications made by two British independent companies to operate all-freight services on international routes: (a) London-Basle-Milan-Rome and London-Marseilles-Rome (Airwork, Ltd.); and (b) London-Lyons-Marseilles (Eagle Aviation, Ltd.). Periods of approval are ten years in the first case and seven in the second.

ANOTHER VISCOUNT RECORD

BRITISH EUROPEAN AIRWAYS' daily Viscount service from London to Geneva was opened with a flourish on Coronation eve—Monday, June 1st—when G-AMNY, *Sir Ernest Shackleton*, clipped 1½ minutes off the existing airline record for this route (held by a Swissair Convair), completing the trip in 1 hr 31 min 52 sec at an average speed of 305.5 m.p.h. The aircraft was flown by Captain W. J. Wakelin and carried 43 passengers. Scheduled time for the 465-mile journey is 2 hr 5 min.

This is the fourth Viscount service to be put into operation by B.E.A. The first turboprop-airliner service—to Cyprus—was inaugurated on April 18th; the following day the London-Istanbul service was opened, and on April 25th the Zurich service began.

A member of *Flight's* staff who was among the passengers on the record flight to Geneva writes: "*Sir Ernest Shackleton* left London Airport at 11.14½ a.m. in pouring rain, and, climbing through the low, racing grey clouds, we experienced one or two sizeable bumps. At 11.30 a.m. Captain Wakelin told us that we were over Seaford at 19,500ft, and that our air speed was 285 m.p.h. The French coast was crossed at 11.48 with Dieppe three miles to starboard. We had been told that we were going



OCEAN AIRLINER: The three Atlantic layouts referred to in the paragraph above. The basic version (top) carries 94 passengers five abreast and the centre drawing shows the 76-seat luxury version. Even in the 113-passenger tourist version (bottom), the full allowance is made for bar, lounge, toilets and galley, and the rows of seats (six abreast) are aligned with the windows. Provision is made for a crew of three—captain, first officer and navigator/radio operator.

CIVIL AVIATION . . .

for the record, although hopes had been lowered by the turbulent conditions over London, and the two stewardesses, Miss Whitehead and Miss Ford, went to work quickly and efficiently, serving an excellent lunch. At noon G-AMNY was five miles east of Paris at 21,500ft; air speed was 300 m.p.h., and we were ahead of schedule. Half an hour later we began the let-down, and on emerging from the cloud sighted the shimmering expanse of Lake Geneva. At 12.45 we touched down at Geneva Airport in bright, warm sunshine, and learned with jubilation that we had, after all, gained a record."

COMMONWEALTH CONFERENCE

SUBJECTS on the agenda of the Fourth Commonwealth Air Transport Council, which was due to be opened on Wednesday by the Minister of Civil Aviation, included policy for non-scheduled operations, revision of the Warsaw Convention, Class-B traffic on the fixed telecommunications network, airport noise, runway economy and future lines of aircraft development. Recent changes in British civil aviation policy were outlined in a statement made by the United Kingdom. Formed in 1945, the Council consists of members from Australia, Canada, Ceylon, the Colonial Empire, India, New Zealand, Pakistan, Southern Rhodesia, the Union of South Africa, and the United Kingdom, with the Minister of Civil Aviation as permanent chairman.

K.L.M.'S RACE ENTRY

ALTHOUGH K.L.M. have entered a DC-6A Liftmaster for the handicap section of the New Zealand Race in October, it is not certain that one of these aircraft (the airline has two on order) will be delivered on time. Furthermore, the announcement that passengers will be carried suggests that a DC-6B or Super Constellation may be used instead. Some Dutch emigrants will be carried and there will also be a limited number of seats for passengers paying the normal fare of about £300; application for tickets are now being invited.

Comfort will inevitably be affected by the short turn-round time at intermediate stops, and no children will be carried. On its return from New Zealand, the aircraft will carry gift parcels from Dutch emigrants living in New Zealand to their relations in the Netherlands. Special air-mail stamps and covers will be issued for the occasion.

CALIFORNIA-PARIS IN ONE HOP

ON May 28th, a DC-6B set off from Santa Monica, Los Angeles, for what was probably the longest non-stop delivery flight ever made by a commercial aircraft. The aircraft, second of three ordered by the French independent airline T.A.I., arrived at Orly (Paris) 20 hr 30 min later, having completed the 5,700-mile journey at an average speed of 278 m.p.h. Capt. Charles Billet was in charge of the flight, which followed the arc of the Polar great circle, passing over Winnipeg, Hudson Bay, and the southern tip of Greenland.

QANTAS TRAFFIC LAST YEAR

FIGURES for Qantas operations in 1952 were recently announced by the chairman, Mr. Wilmot Hudson Fysh (who, incidentally, is made K.B.E. in the Coronation Honours). The distance flown by the company's aircraft during the year was almost 9,970,000 miles, an increase of only 0.3 per cent on the 1951 figure, and the hours-flown figure dropped by 4.6 per cent to 53,098. There was a gain of 0.1 per cent in the number of passengers carried (95,624) but, due largely to the introduction of the Sydney-Johannesburg service on September 1st, the number of passenger-miles flown increased by 8.9 per cent to 194,400,000. There was a 37.7 per cent slump in freight traffic (the total uplift was 8.2m lb), the main contributory factor being a sharp decline on the England-Australia route for two reasons: lack of suitable freight aircraft and restriction of Australian imports over the year. The company's aircraft carried 1.8m lb of air mail, 0.8 per cent less than in the previous year. The overall operating result, expressed in load ton-miles, showed an increase of 4.8 per cent to 32,507,132.

G-AHGF, the modified Rapide referred to in the adjacent paragraph.

DARKER AND LIGHTER: No cabin windows are incorporated in the Douglas DC-6A freighters built for American Airlines; design and construction of the pressurized fuselage are thereby simplified and airframe weight reduced. Three such aircraft are being delivered to A.A.

RICKENBACKER SPEAKS

SOME harsh words on British civil aviation were spoken by the president of Eastern Air Lines, Capt. E. V. Rickenbacker, in a recent interview with *American Aviation*. Explaining why he decided not to order Comets after his much-publicized visit to Hatfield last year, Capt. Rickenbacker stated flatly that the "economics are just not there, performance is not there, capacity is not there, and the Comets are not there." In terms of cost, range and payload, even the Comet 3 was "on the ragged edge," but he would have been willing to gamble on the Series 3 "if we could have gotten them three years ahead of anybody else." His modest requirement, it transpired, was an 80-100-seater, capable of cruising at Mach 0.95—and, if necessary, of pushing safely through the sonic barrier—in addition to being noiseless and having reverse thrust.

B.O.A.C.'s statement that Comet Series 1 operations have shown a clear profit was dismissed as follows: "They are not making any money on that airplane, I will guarantee you. I would like to have what they have lost; I could retire and enjoy what few remaining years I have ahead." Capt. Rickenbacker also complained that British operating deficits were being financed by American tax dollars.

Unlike many other American operators, the gallant captain also appears to view turboprop airliners with disfavour, since he quotes the Viscount "as an illustration of lack of economy in the present design." His argument, however, is based on the assumption that the unit costs of the Super Constellation and the Viscount are equal. In fact, the standard Viscount costs only about one-third of the price of a Super Constellation, and the developed Viscount Series 800, with approximately two-thirds the capacity of the American aircraft, is less than one-half as expensive. Equally questionable is the estimate that the Super Constellation costs "half as much per mile to operate" as the Viscount; twice as much might be nearer the mark.

A UNIQUE RAPIDE

THE accompanying photograph shows G-AHGF, at present the only Rapide in existence fitted with Gipsy Queen 2 engines and type PD.30/211/1 constant-speed airscrews, of the type standardized on Proctors. The conversion from Queen 3 to Queen 2 was carried out by Mr. V. H. Bellamy, of Flightways, Ltd., Eastleigh (who has also, incidentally, recently rebuilt a Gloster Gladiator) and selling rights are held by W. S. Shackleton, Ltd., of 175 Piccadilly, London.

The modified Rapide has been awarded an unrestricted C. of A., and appears to be a very practical "executive" machine, having a performance at least very nearly up to that required by I.C.A.O. for fare-paying transport aircraft.

According to the results of tests carried out recently—unfortunately on a very poor day—take-off distance into a five-knot wind is of the order of 75 yd; cruising speed is 145 m.p.h., or 90-100 m.p.h. on one engine; rate of climb over 1,500ft/min, with 230ft/min on one engine; and fuel consumption less than 10 gal/hr/engine. Although endurance remains unchanged from that of the standard Rapide, range is said to have been increased by approximately 120 miles.

BREVITIES

AUGUST 1st is now given as the opening date for Johannesburg's new Jan Smuts Airport.

* * *

African Trans-Ocean Airlines have recently applied to the South African National Transport Commission for licences to operate scheduled and non-scheduled services from Johannesburg to Europe and America *via* the west coast of Africa; a decision is expected shortly.

* * *

A quarter-scale model of the Comet is a dominating feature of the B.O.A.C.'s new ticket and inquiry office in New York, which was opened last month.

* * *

Air Beef, Pty., Ltd., began its fifth season on May 15th; Freighters will continue to fly carcases from Glenroy to Wyndham until September. In last year's record season, 5,100 head of cattle, amounting to over 2¾m lb of beef, were slaughtered and flown to the coast for export.

* * *

Viscounts may be introduced on B.E.A.'s London-Belfast and London-Glasgow routes by October next. Mr. Peter Masefield announced recently that the five Viscounts so far delivered to B.E.A. had carried 5,000 passengers at 75 per cent load-factor, earning £140,000 revenue. He revealed that the Viscount's break-even factor on the London-Rome sector was 55 per cent, allowing for all costs.

* * *

The president of K.L.M., Dr. Albert Plesman, was present at the recent official opening of the company's new information and reservations centre at the Time and Life Building, New Bond Street, London, W.1. Exceptionally attractive and modern interior decoration is a feature of the building, which has a direct teleprinter link to the K.L.M. central reservations department at Schiphol, Amsterdam. To assist information clerks in dealing with inquiries from the public, a stereoscope has been installed, which shows a selection of extremely realistic full-colour pictures of the cabins of aircraft-types used by the Dutch airline.

* * *

The United Kingdom recently became the nineteenth state to sign the Rome Convention of 1952, which specifies the rules and the limits of liability in the case of an aircraft causing death, injury or damage in foreign territory.

* * *

To enable motorists who use the cross-Channel ferry service to reduce the amount they must spend on dearer Continental petrol, Silver City Airways have installed a filling and service station at Lympne Airport. Vehicles are permitted to fly with tanks three-quarters full.

* * *

In succession to Mr. S. L. Hulme, O.B.E., who has returned to London, Mr. W. M. Hargreaves, C.B.E., A.F.R.Ae.S., has been appointed Northern Divisional Controller at the Ministry of Civil Aviation headquarters at Liverpool. His former post as Director of Navigational Services (Aerodromes) has been filled by Mr. G. M. Stallibrass, O.B.E., A.R.Ae.S.

* * *

A work on nationalized civil aviation, written by Clive Jenkins and entitled *British Airlines*, has been added to the Fabian Research series of pamphlets. The price is 1s. and the publishers are Victor Gollancz, Ltd., 14 Henrietta Street, London, W.C.2.

* * *

A comprehensive book on the legal status of the aircraft commander has won for its author, a member of K.L.M.'s general operations group at Schiphol, a doctor's degree at Leyden University. The book, *The Aircraft Commander in Commercial Air Transportation*, by Dr. M. S. Kamminga, is published by Martinus Nijhoff N.V., 9 Lange Voorhout, The Hague, at a price of ten guilders.

INFORMALITY at SANDOWN

LEA AIRPORT, Sandown, was the pleasant setting for a small rally held on the last day of May by the Isle of Wight Flying Club. Nothing too ambitious was attempted and there was an air of informality and unhurriedness, all of which made the occasion most enjoyable.

The gathering opened at 11.30 a.m. with what was described as a noon patrol; successful invaders were granted the customary meals "on the house," for which purpose all visitors were driven by coach to the nearby Trouville Hotel. After a suitable pause the party returned to the airfield, where there were opportunities for the more ambitious to exhibit their skill in flour-bag bombing and spot-landing.

In all there were 12 competitors, constituting a higher percentage of the available pilots than is usually the case with events of this nature, when most seem to disappear into a form of shy retirement. The selection of aircraft, also, was well representative of the types currently in use: although, as always, the Auster breed was well in evidence, other machines participating were a Tipsy B from White Waltham, a Magister from Elstree, one of the two remaining Monarchs, a Tiger Moth and a Gemini.

Technique in the bombing varied largely with the pilots' skill and mood. Some favoured hurtling towards the target (the inevitable airfield fire-tender) at almost alarming speeds, while others crept past quietly with much flappery extended. Results failed to prove which was the better method, although logic might indicate the latter.

The winner proved to be Mr. Fisher from Christchurch, who positioned his Monarch to allow his bomb-aimer to slide her missiles almost straight down the wing with incredible success. Runner-up was Mr. Shapiro in a well-laden Autocrat from Elstree, while third place went to Mr. Barrow in a Magister from the same stable. The only other contestant to gain any points was the pilot of the little Tipsy of the Fairey Flying Club.

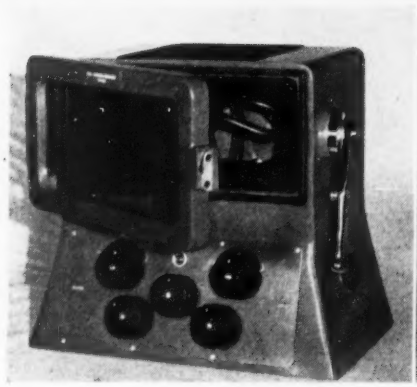
In all, the gathering went very well, though, as is so often the case, the burden of organization fell onto one pair of shoulders, in this case those of Mr. Colin Street, who in his more serious moments flies the local Rapide on charter work. It was pleasant to see that, in addition to being judge, chief marshal and everything else combined, Mr. Street found time to have a crack at the competition himself, in which he handled the local Autocrat with a confidently spirited abandon.

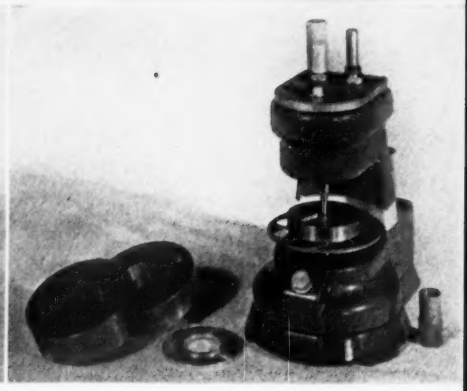
Private flying could do with more small rallies such as this, and there is nothing to prevent each worthwhile club from staging something of a similar calibre; it would contribute a great deal towards maintaining a steady level of enthusiasm throughout the season.

D.F.O.

HERE AND THERE: Miss Herbert and Miss McKim (right), who flew in the Auster-Ragosine Homing competition, reported in last week's issue. (Below) A typical "one-off" private owner modification, this Stinson 105 Voyager has been fitted with a Kinner five-cylinder radial by its Australian owner, Mr. A. van Goes.

INSTRUMENT TEST EQUIPMENT





The test chamber; dimensions are 8½in. x 4¾in. x 6in. (Right) The D.P. tester is particularly useful for Machmeter-testing.

TWO new items of test equipment which should be of considerable value to those concerned with the maintenance of aircraft, research and other instruments operating on the differential-pressure principle are now being put into production by Bryans Aeroquipment, Ltd., Willow Lane, Mitcham, Surrey.

The first is the D.P. tester, which constitutes a compact means of testing differential-pressure gauges over a range of from nearly zero to 40 lb/sq in absolute. Unlike the average kind of fragile barometer or manometer, it is conveniently portable.

Essentially, it is a dead-weight tester provided with a piston and cistern below the weight-carrier, and a similar assembly above it. Air admitted to the lower cistern will "float" the carrier and weight when its pressure is a function of the dead weight and the piston area. Similarly, evacuation of the air space in the upper cistern will cause flotation at the vacuum pressure stated on the weight. Pressure-differentials either positive or negative about atmospheric can thus be measured by use of the appropriate cistern.

The most important function of the tester, however, is its ability to measure pressures which are differential about a pressure other than atmospheric, and more particularly lower than atmospheric—as, for example, in the measurement of Mach numbers. For this purpose, both upper and lower cisterns are evacuated to the stipulated altitude figure, and the weight appropriate to the required Mach number at that altitude is placed on the carrier. Air is then admitted to the lower cistern until the weight floats, when the pressures in the two cisterns are (*a*) the speed pitot pressure, differential about (*b*) the static pressure equivalent of the required altitude.

The altitude pressure initially applied to both cisterns is most conveniently registered by another D.P. tester arranged to measure altitude.

As very small differentials can be detected, it is important to determine the exact point at which the weight-carrier starts to float, and for this purpose there is a simple operating technique of "spinning" the weight-carrier with either an upward or downward bias, according to whether rising of falling pressures are being measured.

The tester is available with weights to cover the following ranges :—

Air speed: 250, 300, 400, 500, 600, 700, 750 kt (calculated to include compressibility effects).

Altitude: 10,000 to 80,000ft in 10,000ft steps.

Mach numbers: 0.5, 0.6, 0.7, 0.8, 0.9, 1.0 at sea level; similar series for 30,000ft.

Weights for other functions can be supplied within the limits of pressures of 0.3in Hg absolute and 68.0in Hg absolute, with differentials in increments of 0.1in Hg, or metric equivalents.

The second new development is a test-chamber designed for use in conjunction with the D.P. tester in the calibration and testing of Machmeters and other low-pressure and vacuum instruments, two of which may be conveniently tested or compared at the same time.

The equipment consists of a cast light-alloy chamber, with a cast skirt on which is mounted a control panel. The chamber has a hinged door fitted with an armour-glass window which permits an unobstructed view of the interior, and airtight closing is afforded by a quick-action cam-type clamp.

The control panel carries five valves and a switch, with the following functions :—(*a*) static selector valve; (*b*) static control valve; (*c*) balance valve; (*d*) pitot selector valve; (*e*) pitot control valve; (*f*) vibrator on/off switch.

The instrument panel is removable to facilitiate the mounting of instruments, on quick-grip mounts. An electrical (six-volt) vibrator is fitted to the panel.

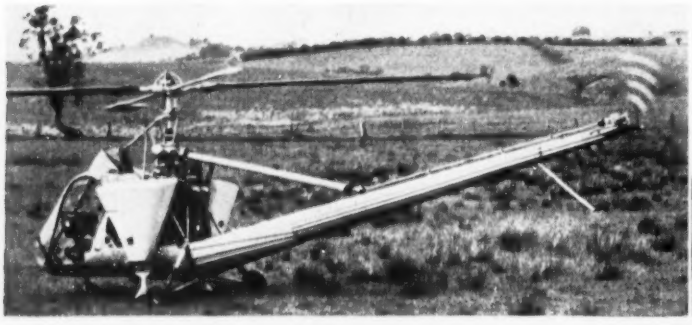
The chamber is designed for use between the pressure limits of 0.10in and 50in Hg absolute, and, it is stated, remains free from leakage over that range. An overload test of 30 lb/sq in is applied before dispatch.

In each of the new testers the operating procedure is straightforward—comprehensive instructions are provided—so that good results should be obtainable by any intelligent operator familiar with the principles of the instruments he is testing.

GREEN PASTURES

AERIAL spraying for the improvement of grassland was effectively demonstrated by Pest Control (U.K.), Ltd., at Forest Lodge Farm, Libanus, Brecon, recently. Several hundred spectators saw an Auster J.5 and two Hiller helicopters in action. The fixed-wing aircraft was fitted with the normal type of spray-bar equipment (as described and illustrated in *Flight* on various occasions in the past), as was one of the helicopters. The other helicopter, however, had hoppers and spreading gear for distributing solid fertilizers at any required weight of between one and two hundredweight per acre. Aerial application of such fertilizers has several advantages : corn crops, for example, can be dressed late in the season, when they are too tall for ground equipment to get through them; again, land that is too hilly for a tractor-drawn distributor can be treated effectively.

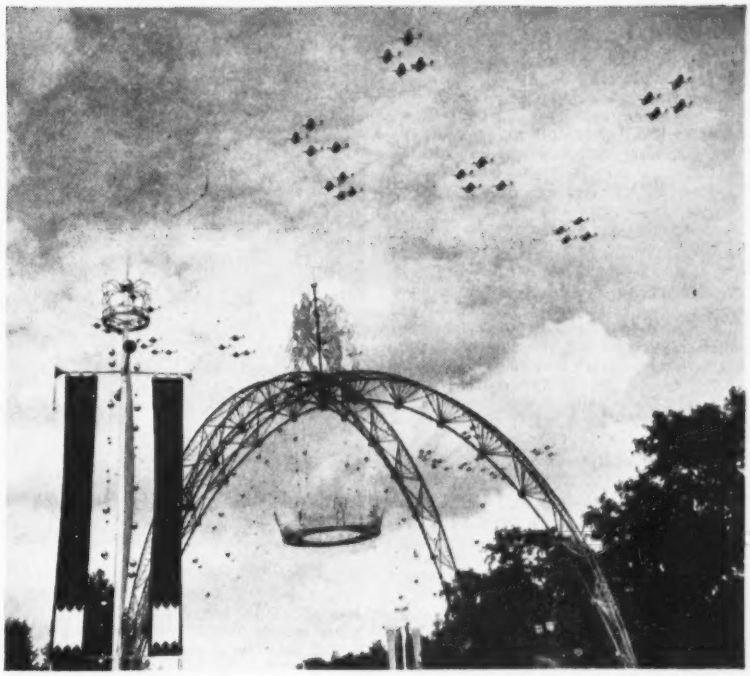
On work of this kind, the Hiller flies rather higher than for spraying, and the swath-width is about 30ft. The fertilizer spread during the Welsh demonstration was nitro-chalk, of which sufficient can be carried in the hoppers to spread four acres at one hundredweight per acre. If the field is near the aircraft refilling and refuelling site—as, in helicopter operation, it is very likely to be—this means that it should be possible to spread about ten loads (i.e., to dress 40 acres) in one hour.



(Left) A Pest Control Hiller "Sprayocopter" with solid-fertilizer hoppers. (Right) The Auster demonstrates spraying at an effective 65-70 m.p.h.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News



AS ARRANGED: Bad weather robbed Fighter Command of its opportunity to fly the pre-arranged R.A.F. Salute fly-past on Coronation Day, shown here passing over the Mall during a rehearsal.

The Duke and Jet Flying

ERRONEOUS reports have stated that the Air Ministry gave "strict orders" that during his recent visit to Fighter Command stations, the Duke of Edinburgh was to be dissuaded from flying jet aircraft as either passenger or pilot. Actually the instructions issued were to the effect that it would be "inappropriate" to offer the Duke a flight—a very different thing.

At the present stage of his training—he is now getting twin-engine experience on an Oxford—he would certainly not fly solo in jet fighters. The acceptance of jet-flying risks is presumably an entirely private matter between the Queen and himself, and any expression of national anxiety on the subject would be made by the Prime Minister.

When the Duke flies, every possible care is taken to ensure his safety; but he is a Marshal of the Royal Air Force, wearing his wings, and it would certainly be "inappropriate" for any stipulation to be made as to the types of Service aircraft in which he should fly.

CORONATION HONOURS

BELOW are continued from page 737 the list of awards, with two additional honours, granted by H.M. the Queen on the occasion of her Coronation.

ROYAL VICTORIAN ORDER

Knight Grand Cross.—Air Chief Marshal Sir William Elliott.

ORDER OF THE BRITISH EMPIRE

Commander.—G/C. Bruce Robinson.

AWARDS

Air Force Medal.—Flight Sergeants B. R. Bradley, J. Dougan, A. J. Fairbairn, A. B. Fraser, K. Gorny, T. M. Hamer, W. F. J. Hills (now Master Signaller), A. B. Howes, T. McHugh, D.F.C., A. H. Shelton, H. F. J. Thorpe. Sergeants Z. Atanackovic, R. E. Bowler, G. A. Hall, W. S. Jones, J. P. McCarthy, D. V. Sutton, R. T. Vane.

British Empire Medal.—Flight Sergeants J. Dennis, W. L. Gardner, G. F. Hankinson, R. Heather, T. A. W. Kinzett, W. F. Lane, L. Mallinson, J. O'Rourke, R. Palin, R.Aux.A.F., R. R. L. Peers, F. N. Ratliff. D. W. Sarbutt, H. Schofield, A. C. Scott, L. F. Vanderson, I. C. Webb, H. W. Wright, L. G. Young. Act. Flight Sergeants G. Briggs, L. J. Cross, L. E. Lee, W.R.A.F., J. W. Warren. Sergeants F. W. E. Day, R.Aux.A.F., A. S. Huggett, W. Lippiatt, G. N. Lipscomb, D. R. Macintosh, F. A. Monks, A. E. Nash, F. T. Spencer. Act. Sergeants F. Braggs, L. Jenkins, A. F. G. Phillips, W. E. Thompson. Chief Technician D. Thompson. Corporals F. Bennett, P. G. Bowerman, E. Chatt, A. Swail. Act. Corporal K. Ashmore. Senior Aircraftmen C. A. Bates, J. F. Smith-Woodward.

Fifty Queen's Commendations for Valuable Service in the Air have also been announced.

For Service in Far East

THE Queen has been graciously pleased to approve the following honours and awards for service in Japan, Korea and Malaya. *O.B.E.*—S/L. F. A. B. Tams. *M.B.E.*—F/L. W. J. Bishop. *Bar to D.F.C.*—F/L. I. R. Dowling. *D.F.C.*—F/L. A. M. Laidlay, Capt. W. C. A. Nicholls, R.A., F/L. R. Harling and F/O. S. Edmonson. *D.F.M.*—Sgt. B. Grace. Act.F/Sgt. A. Moss. *B.E.M.*—Sen.Tech. W. W. Perryman, Sgt. M. W. Dacre, Cpl.Tech. V. F. Sowerbutts and Cpl. D. A. W. Skipper.

R.Aux.A.F. Appointments

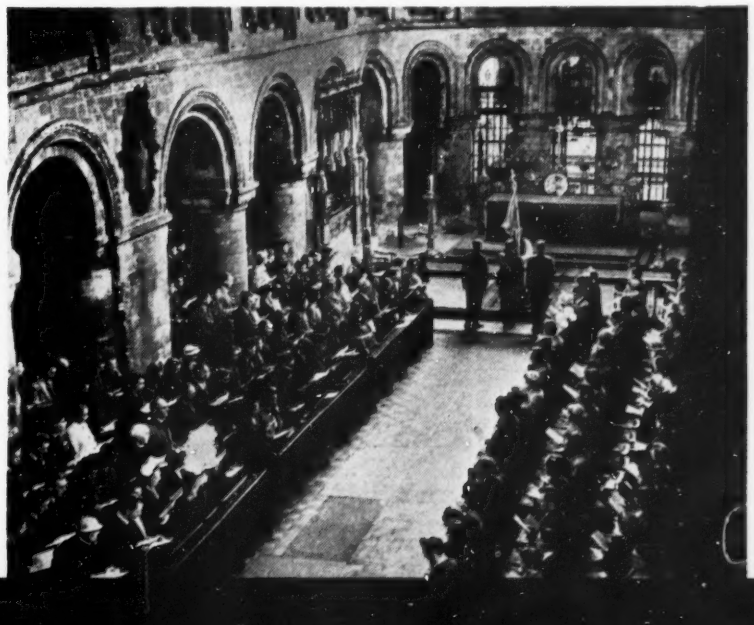
THE Air Ministry has announced two appointments to command R.Aux.A.F. units of which H.M. the Queen is Honorary Air Commodore. S/L. R. L. R. Davies, D.F.C., is to command No. 603 (City of Edinburgh) Squadron and S/L. C. T. Moore to command No. 2603 (City of Edinburgh) Light Anti-Aircraft Squadron.

S/L. Davies is a regular R.A.F. officer and was, from May, 1951, to March of this year, training officer with No. 600 (City of London) R.Aux.A.F. Squadron. S/L. Moore was originally commissioned in the East Yorks Regt. but resigned after three years service. In 1940 he joined the R.A.F. as an aircraftsman, becoming commissioned again in 1942.

R.A.A.F. Long Range Flight

CREWS to fly the two Canberras of the Royal Australian Air Force in the England-New Zealand race next October, are training with No. 1 Long Range Flight at Laverton, near Melbourne.

Each crew will comprise two pilots and one navigator and will be selected from the six pilots and three navigators now training. W/C. D. R. Cuming, who commands the Long Range Flight, is expected to captain one of the Canberras and S/L. Raw, D.F.C., the other. Second pilots will be chosen from F/L. F. N. Davis, F/L. C. G.



"Flight" photograph

CHURCH PARADE: The scene in the ancient church of St. Bartholomew-the-Great, Smithfield, as the newly-presented Squadron Standard was being handed to the Rev. Dr. N. E. Wallbank to be laid on the altar during the annual church parade held by No. 600 (City of London) Squadron, R.Aux.A.F. on Sunday last.

SERVICE AVIATION . . .

Kilsby, F/O. R. J. Atkinson and P/O. M. J. Ridgeway.

The three navigators, from which two will be chosen, are: S/L. C. G. Harvey, who was W/C. Cuming's navigator in the first Canberra flown from England to Australia in August 1951, F/L. W. D. Kerr and P/O. J. Bell.

Helicopters in Malaya

REPORTS from Malaya indicate that No. 848 Squadron, F.A.A., has been engaged on an extremely active tour of duty. Between February 2nd and April 30th a total of 915 hours were flown, of which 614 were on operational flights. Altogether, the ten helicopters have flown 1,780 sorties, lifted 1,433 troops and evacuated 61 casualties. The unit is commanded by Lt.-Cdr. S. H. Suthers, D.S.C.

Vickers Trophy

COMPETED for annually by M.E.A.F. units operating Valettas, the Vickers Trophy has been won by the Aden Communications Squadron at R.A.F. Station Khormaksar. It is awarded to the squadron or flight with the best record for safety and for technical and training efficiency.

Last year's winner, No. 70 Squadron, was placed fourth, the Iraq Communications Flight was second and No. 84 Squadron third. During 1952 the winning squadron carried 4,873 passengers, and freight totalling 22,399,147 lb. in 4,405 hours flying time.

Making a Shoal

ON Saturday, May 30th, members of the Goldfish Club held their second reunion at the R.A.F. Reserves Club's new headquarters at 14 South Street, Park Lane, London. Mr. C. A. Robertson was in the chair.

Decorations were appropriate to the occasion—the dining-room was gay with flags of all the services in which members were serving at the time they "returned home by dinghy," and the centre piece was a fighter pilot's inflated dinghy filled with water, in which dozens of goldfish swam happily round. Goldfish in bowls were also part of the table decoration.

The guest of honour was Sir Archibald McIndoe, who proposed the toast of the club. The reply was by Mr. C. A. Robertson, founder and present chairman. A message was received from H.M. the Queen's private secretary, saying: "I am commanded by the Queen to convey to all members of the Goldfish Club Her Majesty's warmest thanks for their kind and loyal message of goodwill."

Mr. C. A. Robertson was a designer to P. B. Cow and Company, Ltd., the dinghy manufacturers, and was responsible for the founding of the club and its maintenance since. It was first formed in 1942 for those who baled out over, or force-landed in, the sea and whose lives were saved by the inflatable dinghy.

NOURISHMENT PROVIDED: Meteor pilots of No. 64 Squadron, with whom "Flight's" representative flew in the Coronation fly-past, pictured in the squadron briefing room at Duxford before take-off. In the centre is the C.O., S/L. H. Bennett, above the suitably inscribed briefing blackboard are the faces of the flight commanders, F/Ls. Spiers and Young, and on the extreme right is P/O. John Heard who flew the Mark 7 on this occasion for "Flight's" benefit. The blackboard heading refers not to a new breakfast food, but to the squadron's R.T. callsign.

R.A.F. Bisley Meeting

FIFTEEN hundred competitors will take part in the Royal Air Force Small Arms Association's 27th annual championship meeting which opens at Bisley tomorrow, June 13th, and continues until June 20th.

The ceremony of "Chairing the rifle champion" will be initiated this year and will take place at the end of the Rifle Hundred Match, at noon next Friday. The chair, which is handsomely carved, has been presented by Air Marshal Sir Thomas Warne-Browne. The champion will be chaired from the firing point, headed by the R.A.F. Central Band and will be escorted to the National Rifle Association's pavilion.

In honour of the Coronation a special sweepstake has been arranged in conjunction with the first stage of the Rifle Championship and the Rifle XX match. There will be no money prizes, but winners will receive a medal specially struck for the occasion, bearing on the obverse the effigy of the Queen's head and on the reverse a design similar to that on the special medals given by the association.

The annual general meeting of the R.A.F. Small Arms Association will be held in the association's new club house at Bisley next Wednesday. The club house formerly belonged to the Inns of Court R.C. and has recently been purchased by the association. Air Marshal Sir Ronald Ivelaw-Chapman has accepted the presidency of the association for this year and the chairman is G/C. G. E. Watt, who succeeded A.V-M. W. E. Staton last year.

Ferrying Carriers

THE Admiralty has announced that H.M.S. *Unicorn*, *Perseus* and *Pioneer* have been redesignated as ferry carriers. Their function will be to transport air squadrons, including both men and aircraft, to and from operational aircraft carriers.

Unicorn (Capt. P. R. S. Pennefather, R.N.) is at present in the Far East as support carrier to H.M.S. *Ocean* (Capt. B. E. W. Logan, R.N.). *Perseus* (Capt. P. C. S. T. Carey, R.N.), which was recently engaged on trials with the new Mitchell steam catapult, is already engaged on ferrying duties and *Pioneer* is in reserve.

GOLDFISH RE-UNITE: Some members and personalities attending the Goldfish Club's reunion held at the R.A.F. Reserves Club on May 30th. Left to right, Mrs. M. Cornwall—ex-Wren and only lady member, Major W. M. Pickard, U.S.A.F., S/L. D. Farrell, Air Historical Branch, Air Ministry, L. Colquhoun, Vickers test pilot, Sub-Lt.(A) E. W. Beeny, W/C. P. H. Watts, Dep. Director R.A.F. Search and Rescue Organization, S/L. W. A. G. Goldsworthy, Hon. Sec. R.A.F. Reserves Club, Sir Archibald McIndoe, and W/C. R. R. Stanford Tuck, Vice-Chairman Goldfish Club. *(See "Making a Shoal" above.)*

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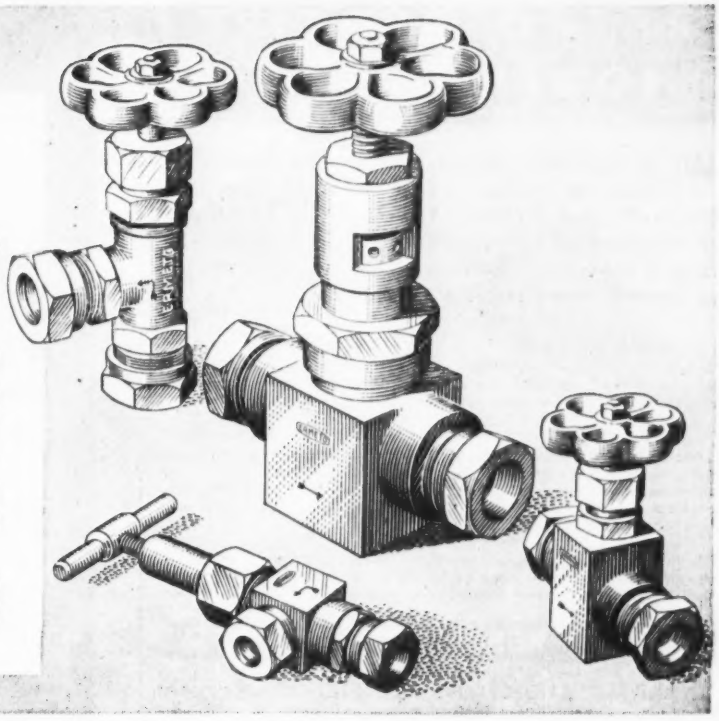

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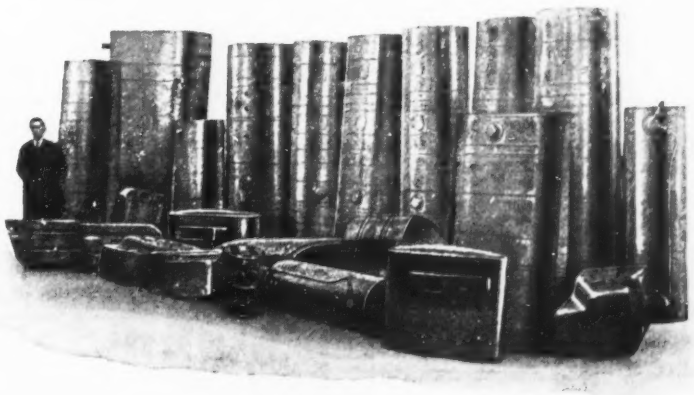

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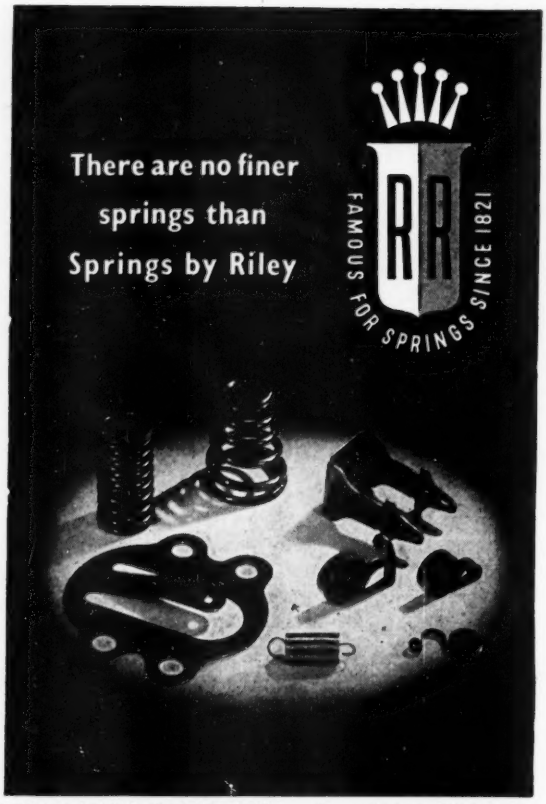

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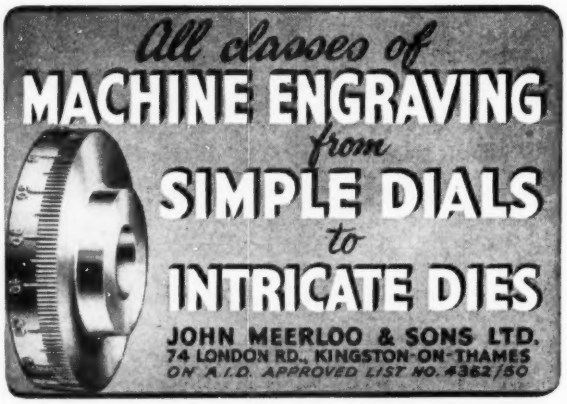

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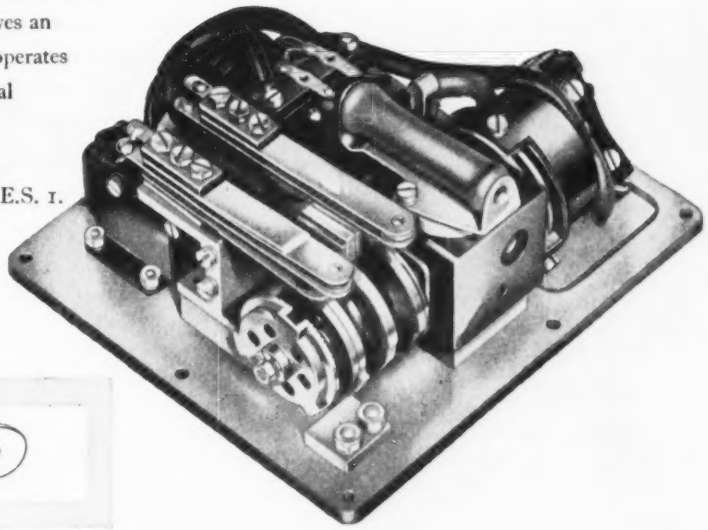

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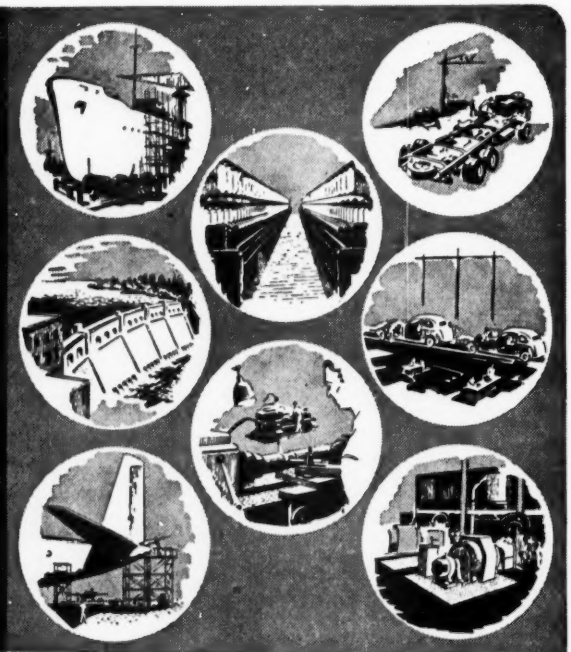

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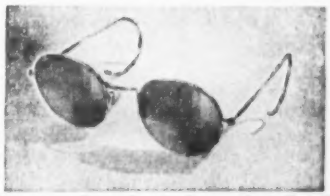

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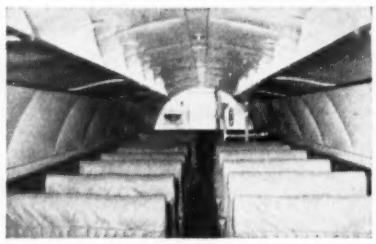

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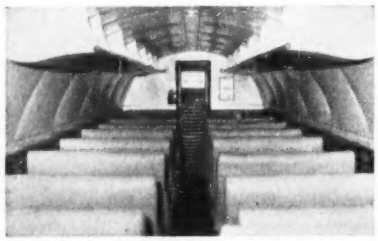

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INDEX TO ADVERTISERS

	Page
Aerocontacts, Ltd.	28
Alvis, Ltd.	Cover i
Amal, Ltd.	27
Armstrong Whitworth Aircraft, Ltd., Sir W. G.	12
Automotive Products Co., Ltd.	Cover ii
Aviation Traders, Ltd.	20
B.B. Chemical Co., Ltd.	20
Birkett and Sons, Ltd., T. M.	26
Blackburn and General Aircraft, Ltd.	9, 30
Bristol Aeroplane Co., Ltd., The	Cover iv
British Aviation Insurance Co. Ltd. The	24
British Ermeto Corporation, Ltd.	23
British European Airways	13
Brown and Co., Ltd., E. G.	33
Brown Tractors, Ltd., David	14
Bryans Aeroquipment, Ltd.	21
Burnley Aircraft Products, Ltd.	21
Canadair, Ltd.	19
Cross Manufacturing (1938), Ltd.	27
De Havilland Aircraft Co., Ltd., The	16, 31
Dowty Equipment, Ltd.	31
Dunlop Rubber Co., Ltd.	31
English Electric Co., Ltd., The	17
Fairey Aviation Co., Ltd., The	15
Feltham and Sons, Ltd., Walter H.	31
Firth and John Brown, Ltd., Thos.	11
Flight Refuelling, Ltd.	24
Fox and Sons (Aviation), Ltd., C. J.	27
General Electric Co., Ltd., The	26
Godfrey and Partners, Ltd., Sir George	1
Greenwood (Willesden), Ltd., P. W.	22
Hellermann, Ltd.	10
Henlys, Ltd.	29
Hobson, Ltd., H. M.	4, 30
Hymatic Engineering Co., Ltd., The	3
I.V. Pressure Controllers, Ltd.	22
Kidde Co., Ltd., Walter, The	8
Lewis, Ltd., D.	27
Merriloo and Sons, Ltd., John	24
Mollart Engineering Co., Ltd., The	10
Muir and Adie, Ltd.	32
Percival Aircraft Ltd.	18
Redifon, Ltd.	8
Riley, Ltd., Robert	24
Robinson and Co. (Gillingham) Ltd., L.	22
Salter and Co., Ltd., George	Cover iii
Sangamo Weston, Ltd.	14
Short Bros. and Harland, Ltd.	29, 30
Simmonds Aerocessories, Ltd.	2
Staravia	31
Stream-Line Filters, Ltd.	24
Sugg and Co., Ltd., William	22
Tecalemit, Ltd.	6
Teddington Controls, Ltd.	25
Uhlhorn Brothers, Ltd.	32
Vickers-Armstrongs, Ltd.	5, 31
Vokes, Ltd.	25
Westland Aircraft, Ltd.	7
Wolverhampton Aviation, Ltd.	27

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